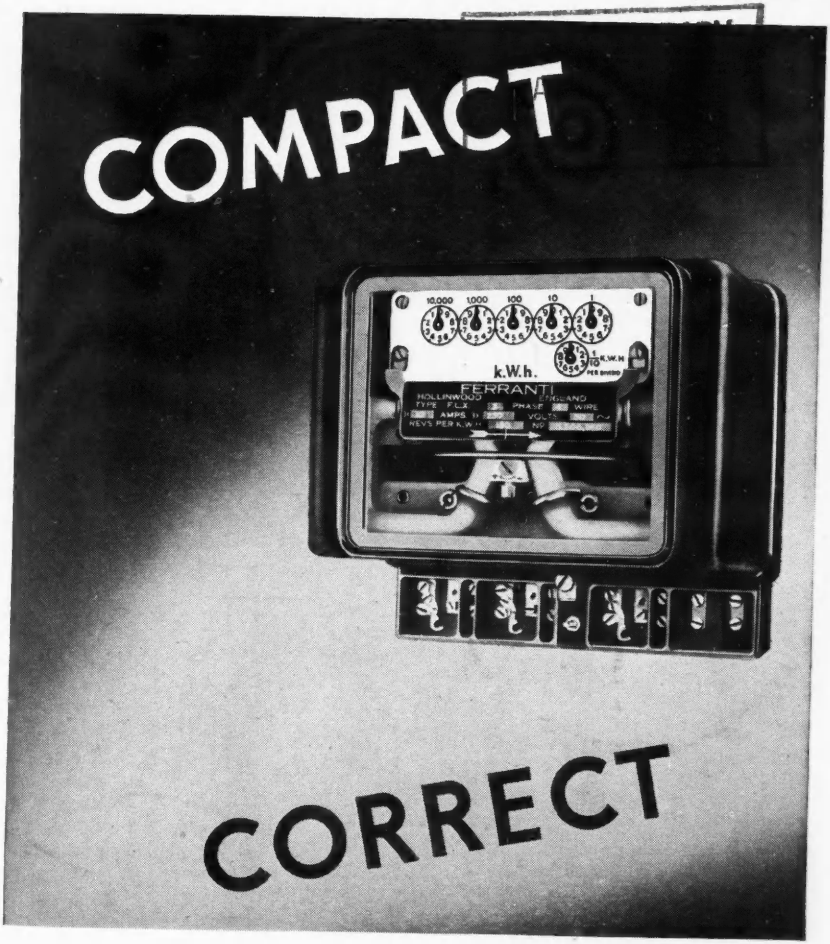
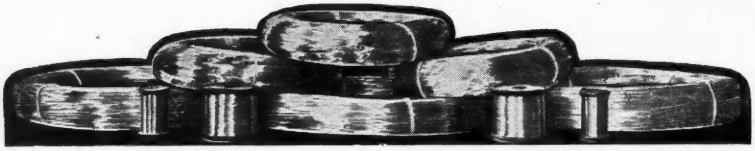
ELECTRICAL REVIEW

FOUNDED 1872

Vol. CXXXI. No. 3372. JULY 10, 1942 6d. WEEKLY





H.C. Soft Plain Tinned and Hard Drawn Copper Wire and Strip for all purposes

BRASS WIRE and STRIP

R. H. SYMONDS LTD.
39 VICTORIA ST., WESTMINSTER, S.W.1
Telephone No.: ABBEY 2771-5

Simple-Speedy-Reliable-
the safe Insulation Stripper

MADE IN ENGLAND

Severs the insulation cleanly without damaging the conductor, by means of an electrically heated resistance wire. Recommended for the various types of wires used in the Radio Electrical Instrument and allied trades. Suitable for supply Voltages 220-250 A.C. Consumption 30 watts. *Please write for further details.*

SOLON
ELECTRIC
INSULATION STRIPPER

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Sales/Engineering Dept., **MILTON COURT, WESTCOTT, DORKING, SURREY**

Production now Restricted...

SWAN BRAND
TRADE MARK
BRITISH MADE

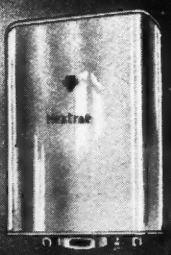
ALUMINIUM DOMESTIC WARE & ELECTRICAL APPLIANCES

But not for always

M-W.44

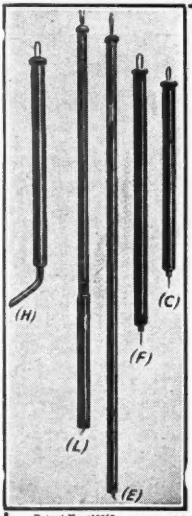
HEATRAE

ELECTRIC WATER HEATERS



Even were we to cease advertising (per Press announcements) to-day, our products would still continue to proclaim, for years to come, the workmanship we had built into them.

HEATRAE LTD NORWICH · GRAMS "HEATRAE" NORWICH · PHONE: NORWICH 25131



IS IT ALIVE?

THE "PARTRIDGE" PRESSURE DETECTOR

(Regd. T.M. No. B.581955)

will infallibly tell you, giving visible and audible indication

(No earth connection required)

Type	Range up to	Length of handle
C	Volts 11,000	36"
E	60,000	84"
F	15,000	48"
H	11,000	36"
L	33,000	72"

Also makers of "Westminster" Vacuum Tube Detector and H.T. Earthing Rods

Patent No. 519919

The WESTMINSTER ENG. Co. Ltd.

Victoria Road, Willesden Junction, N.W.10

Telephone: Willesden 1700-1 *Telegrams:* "Regency, Phone, London."

TAG TERMINALS

FOR WIRELESS AND SIMILAR CONNECTIONS

A WIDE RANGE OF SIZES IN STOCK

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ASHBROOK ROAD, LONDON, N.19

BRASS STRIKERS

to the specific requirements of our customers.

Makers of all types of repetition products from the bar in all metals.

M·C·L and REPETITION LTD. Pool Lane, Langley, Bham.

A

Why not use the Best?

CLARKE'S 'ATLAS'

MICA & MICANITE INSULATION

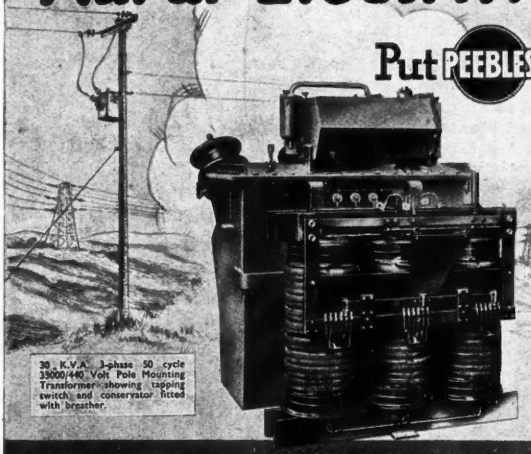
TUBES: Round, square or rectangular, in Mica or Bakelite.
MICANITE: In Moulding, Flexible and Commutator qualities.
HEATER MICANITE for domestic and other Electrical Appliances.
MICA: Uncut or cut to size and calibrated.
MICA for all Electrical Gear and Domestic Appliances.

MICAFOLIUM : MICA PAPER, MICA CLOTH : INSULATED STEEL BARS AND TUBES : LEATHEROID. FIBRE : BAKELITE SHEETS : YELLOW OR BLACK INSULATING CLOTH. TAPES AND SLEEVING.

H. CLARKE & CO. (MANCHESTER) LTD. ATLAS WORKS, PATRICROFT, MANCHESTER

Rural Electrification—

Put PEEBLES Transformers on your Poles



30 K.V.A. 3-phase 50 cycle 33000/440 Volt Pole Mounting Transformer showing tapping switch and conservator fitted with breather.

Many thousands of Peebles Pole Mounting Transformers are efficiently serving the rural districts of the nation and in countries overseas.

Their unvarying reliability season after season, during stormy weather, with temperatures below zero, or in the hottest days of summer, ensures an unfailing supply of power to large numbers of villages, hamlets and farms.

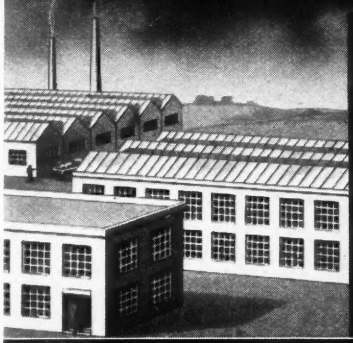
PROVED IN PRACTICE ALL OVER THE WORLD

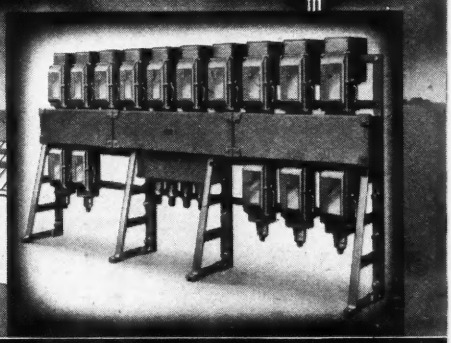
BRUCE PEEBLES & CO. LTD.
ENGINEERS EDINBURGH
Manufacturers of all sizes and types of Rotating Electrical Machinery, Transformers and Rectifiers

3561

MAIN CONTROL GEAR
for all factories

BILL





LONDON: A W ZELLEY
73, GREAT PETER ST.
WESTMINSTER, S.W.1
BIRCHFIELDS 5011 (4 LINES)

BILL SWITCHGEAR LTD
BIRMINGHAM 20

MANCHESTER GLASGOW
BELFAST BURTON-ON-TRENT
EXETER SOUTHAMPTON
"BILSWITCH" BIRMINGHAM

Evidence of Reliability!

SIEMENS

ELECTRIC LAMPS

MADE IN ENGLAND

are used by GOVERNMENT DEPARTMENTS, MUNICIPAL AUTHORITIES, L.C.C., RAILWAYS AND DISCRIMINATING BUYERS EVERYWHERE

Sell SIEMENS *and satisfy*

Advt. of **SIEMENS ELECTRIC LAMPS AND SUPPLIES LIMITED, 38/39 Upper Thames Street, London, E.C.4**
Branches at-Belfast, Birmingham, Bristol, Cardiff, Dublin, Glasgow, Leeds, Liverpool, Manchester, Newcastle-on-Tyne, Nottingham, Sheffield

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ELECTRIC MOTOR POLISHERS

A. C. 4 BEARINGS
400 VOLTS, 3 PHASE
50 CYCLES.
1, 2, 3, 4 AND 5 H.P.

DELIVERY—
IMMEDIATELY ON
RECEIPT OF MACHINE
TOOL LICENCE AND
CONTRACT NUMBER

for IMMEDIATE DELIVERY!!

W. CANNING & Co LTD
GREAT HAMPTON STREET
BIRMINGHAM · 18

METAL-ENCLOSED AIR-INSULATED

B T-H SWITCHGEAR

RING-MAIN

CLASS QA

Extensible without alteration to cabling.

UP TO 11 KV., 150 MVA.

BTH switchgear is manufactured for all conditions of service, indoor or outdoor, for :— Power-stations; Substations; Marine Service; Rural Electrification; Factories; Mines; Chemical Works; and every Industrial Application.

BTH

THE BRITISH THOMSON-HOUSTON CO., LTD.
CROWN HOUSE, ALDWYCH, LONDON, W.C.2.

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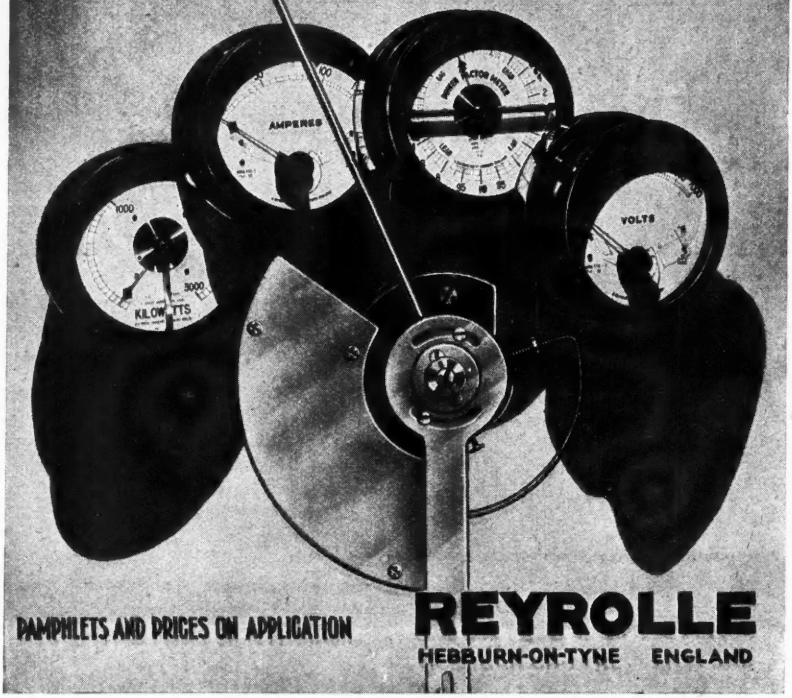
COMMERCIAL ALTERNATING-CURRENT TYPE
B.S. FIRST GRADE
ALL AVAILABLE IN ORDINARY OR TROPICAL FLUSH OR PROJECTING CASES
AMMETERS AND VOLTMETERS ALSO AVAILABLE IN CONTROLLER OR FLAMEPROOF CASES

DESIGNED TO STAND 50 TIMES RATED CURRENT FOR ONE SECOND



PAMPHLETS AND PRICES ON APPLICATION

REYROLLE
HEBBURN-ON-TYNE ENGLAND

Well, no ! Not yet, anyway.
Tho' we have all heard about milk for [plastics—plastics for Cows is something new.
Something which we, DE LA RUE PLASTICS, have been pleased to develop in collaboration with Gascoignes of Reading, the milking machine specialists.
The illustration below shows a sectional view of this clever Pneumatic Pulsater

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MEANS
GREATER OUTPUT

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FOR MACHINE TOOL AND BENCH LIGHTING

- Universal movement
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Made in Single-, Two- and Three-arm Extensions

Adopted by many of the Armament and other War Production firms

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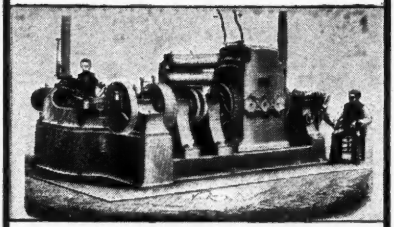
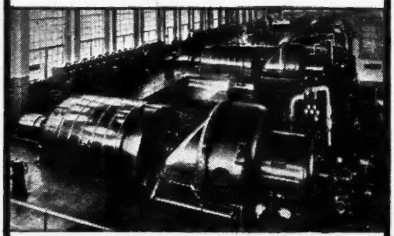
Midland Representative:
W. T. BOWER, 184 Lockey Road, Sutton Coldfield

In 1882 — when the 'Edison System' for power stations was invented — we pioneered the battery



Today important central stations rely upon our batteries



For over fifty years our batteries have proved their reliability. In 1882 they lit the Royal Exchange, and today they are widely used for Central Stations, Telephone Exchanges, Country Houses and for emergency lighting of important buildings.

CONTRACTORS therefore specify P. & G. & E.P.S. Cells with confidence for every type of job where reliability is a first essential.

EMERGENCY LIGHTING EQUIPMENT

(Licensed under Patent No. 313248). Emergency Lighting Equipment suitable for all types and sizes of installations can be supplied. Details on request.

REPLATING

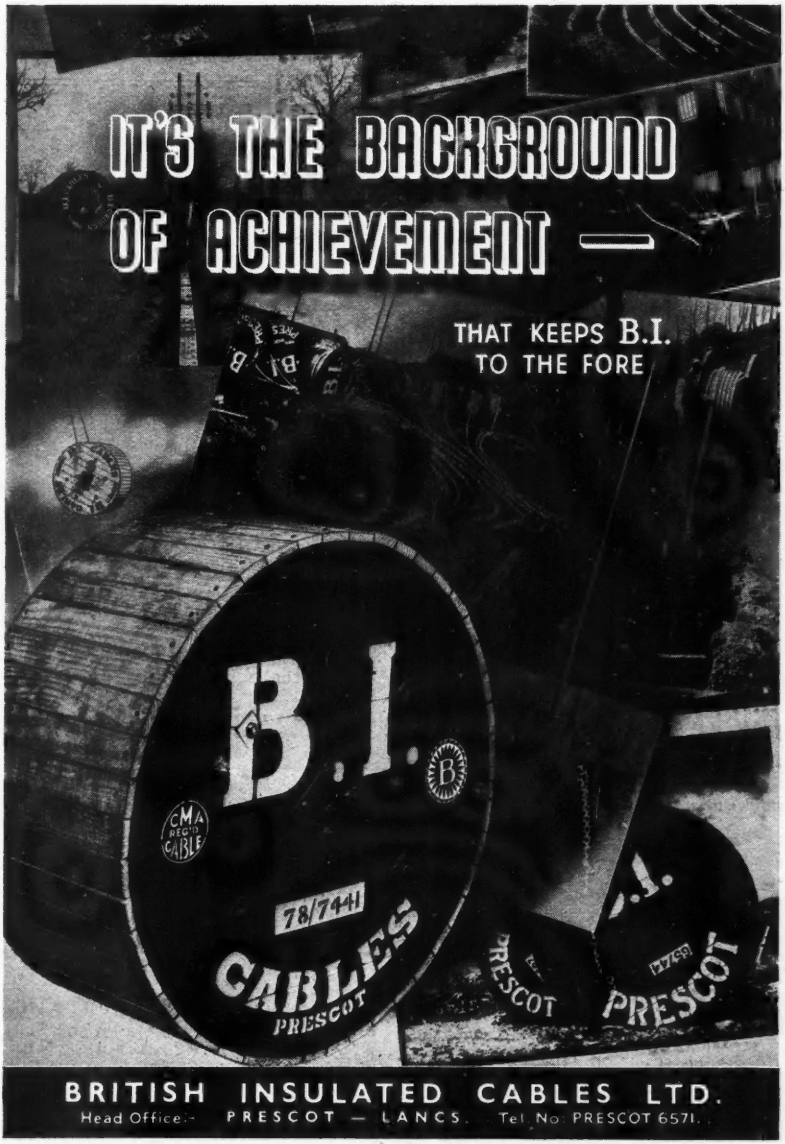
Our replating jobs are renowned for their long and reliable service.

PRITCHETT & GOLD and E.P.S. Co. Ltd

Formerly The Electrical Power Storage Co. Ltd
— The first battery makers —

50 Grosvenor Gardens, London, S.W.1
Telephone : Sloane 7164
Telegrams : Storage, Sowest, London

PG1b./41


IT'S THE BACKGROUND
OF ACHIEVEMENT —
THAT KEEPS B.I.
TO THE FORE
B.I.
CMA REG'D CABLE
78/7441
CABLES
PRESCOT
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PRESCOT
BRITISH INSULATED CABLES LTD.
Head Office:- PRESCOT — LANCS. Tel. No: PRESCOT 6571.

REGISTERED ASSOCIATION MARK

The Members of the

Association of Steel Conduit Manufacturers

have pleasure in announcing that the

10%

EXCLUSIVE BUYING BONUS

and

ADDITIONAL QUANTITY REBATES

at percentages based upon
annual purchases of A.S.C.M. Steel Conduit

Will be continued for the year commencing 1st May, 1942

Full details of the Scheme may be obtained from any Member, any Authorised Wholesale Factor, or from:

The Secretary,
Association of Steel Conduit Manufacturers,
25 Bennett's Hill,
Birmingham 2.

The Members of the Association are :—

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Credenda Conduits Co. Ltd.
Perfecta Tube Co. Ltd.
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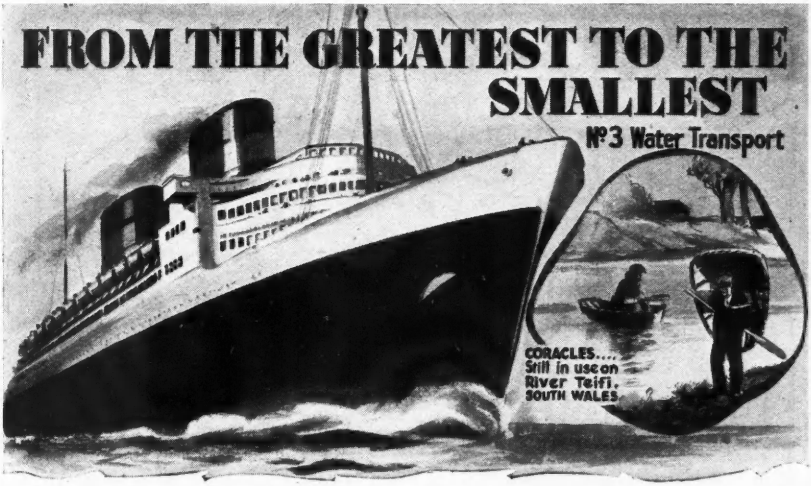
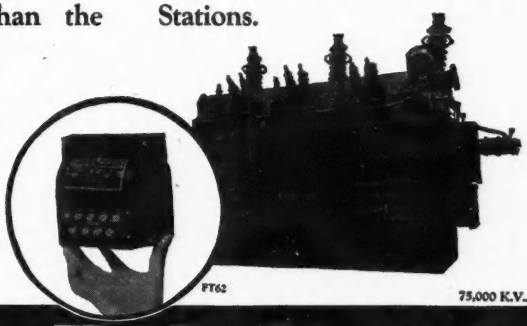
METALLIC SEAMLESS TUBE CO. LTD.
STEEL TUBE & CONDUIT CO. (Middlesbrough) LTD.
TALBOT-STEAD TUBE CO. LTD.
TIPPER BROTHERS (BILSTON) LTD.
WALSALL CONDUITS LTD.

Advertisement of the Association of Steel Conduit Manufacturers, 25 Bennett's Hill, Birmingham 2



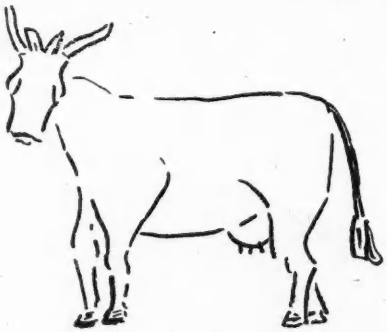
BRITISH Shipbuilding, which began with the coracle, is represented to-day by the greatest liners in the world. Striking as this comparison is, it is no more remarkable than the diversity in sizes of the Ferranti Transformers, which range from the smallest radio receiver unit to the giant transformers employed by the largest Power Stations.

During 60 years of continuous development, Ferranti Transformers have always led the field in compact, modern design and efficient performance.



FERRANTI
Transformers

FERRANTI LTD., Hollinwood, LANCS. *London Office: Bush House, Aldwych, W.C.2*



ONCE UPON A TIME

Cow used to make milk for our porridge, but really a NECO Motor did the work—Cow just stood by. Now there are so few NECO Motors available to drive milking machines Cow has to do something for herself and this makes her tired so there's not so much milk.

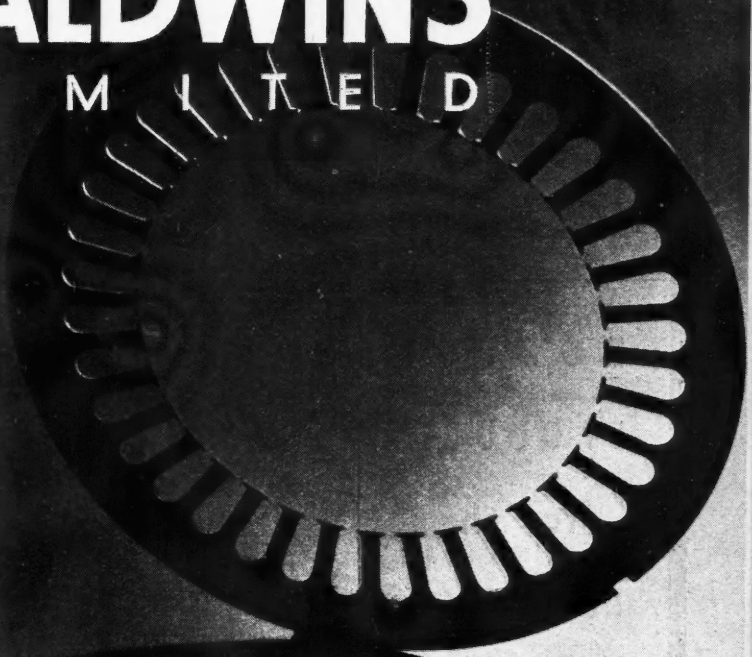
THE NORMAND ELECTRICAL COMPANY LIMITED
North Street • Clapham Common • London, S.W.4
Telephone: MACaulay 3211/4

NECO

Registered Trade Mark

E.G.B.47

BALDWINS
LIMITED

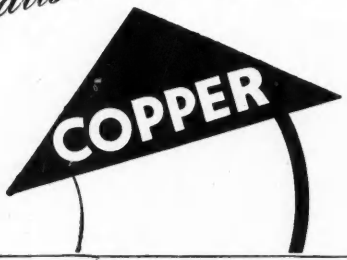


TRANSFORMER SHEETS

ELECTRICAL SHEETS

ELECTRICAL STAMPINGS

Specialists since 1783



BOLTON PRODUCTS for the ELECTRICAL INDUSTRY

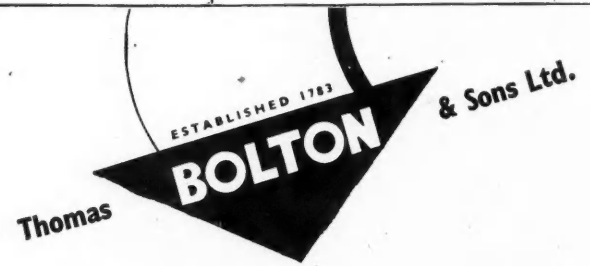
The combination of metallurgical research with modern production has confirmed the leadership of Bolton Copper Products. Since their introduction more than a century and a half ago, they have set a standard of reliability which has become recognised the world over.

★ **"COMBARLOY"**
(for commutator bars, brushes, etc.)

★ **COPPER WIRE, STRIP, BUS-BARS, COMMUTATOR SEGMENTS.**

★ **PATENTED CELLULAR CONDUCTORS**
(for extra high tension currents).

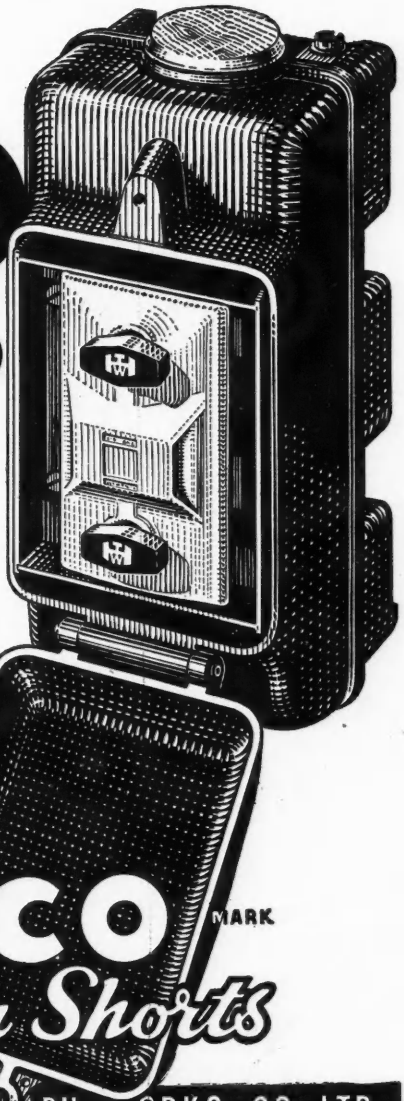
★ **TROLLEY WIRE.**



THOMAS BOLTON & SONS LTD. HEAD OFFICE : WIDNES, LANCS. P.O. BOX No. 3
Telephone : Widnes 2022.
London Office : 168 Regent Street, W.1. Telephone : Regent 6247/8/9.

CVS-18

for 500 amps



Here is the latest addition to the range of ISCO Ironclad Service Fuses. The general design is similar to that of the 200 amp. and 300 amp. single pole ISCOS.

Henley patent Wedge type Cartridge Fuses ($3\frac{5}{8}$" fixing centres) or Henley patent Wedge type Links can be fitted as required.

Full details on request.

TRADE ISCO MARK

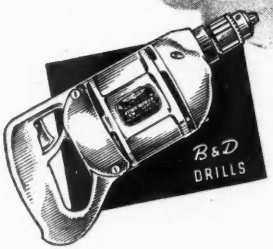
Safe on Shorts

W. T. HENLEY'S TELEGRAPH WORKS CO. LTD.

MILTON COURT · WESTCOTT · DORKING · SURREY

PHONE DORKING 3241 (10 LINES)
TELEGRAMS: HENLETT, DORKING

Make sure with
SIMPLEX
SIMPLEX
SIMPLEX



★ The only knitting that Granny does is with her brows—from behind these the old lady still produces young ideas. When invited to tea with the knitting party she told them that even if balaclavas and pullovers had to be knitted by hand, there was no need to waste time winding wool that way. So after quoting the necessary "Comforts" priority number she soon obtained a Black & Decker Drill. Now she winds all the wool, and the number of finished pieces produced by the knitting party has been speeded up ever so much. Granny only exists in our imagination of course, and her idea of using a B. & D. Drill for winding wool is not really practical. Nevertheless we do hope she will remind you that many jobs in your factory can be produced—

Quicker and better with

Black & Decker

PORTABLE ELECTRIC TOOLS

Write for Catalogue 1.37

BLACK & DECKER LTD., HARMONDSWORTH, MIDDX.

PHONE: WEST DRAYTON 2601/5 'GRAMS: "BLACDECK, WEST DRAYTON."

SERVICE CENTRES AT BIRMINGHAM, BRISTOL, GLASGOW AND MANCHESTER

Smee's

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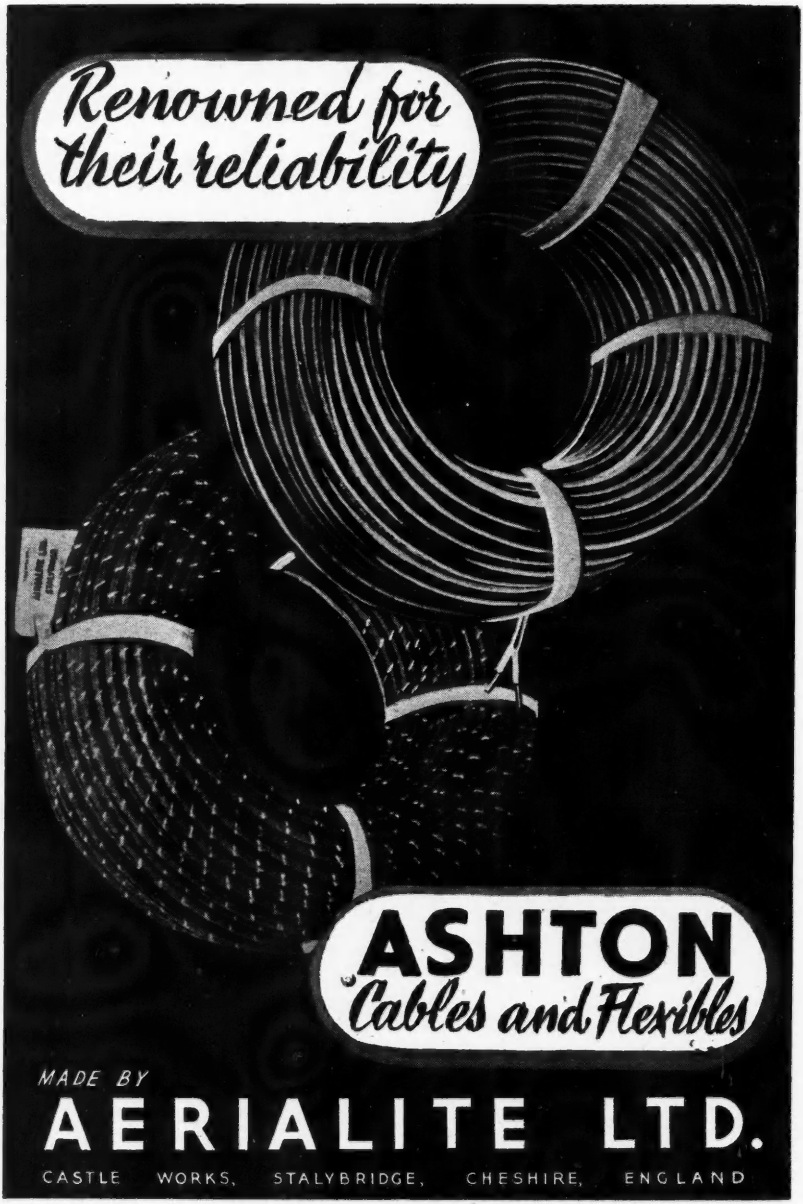
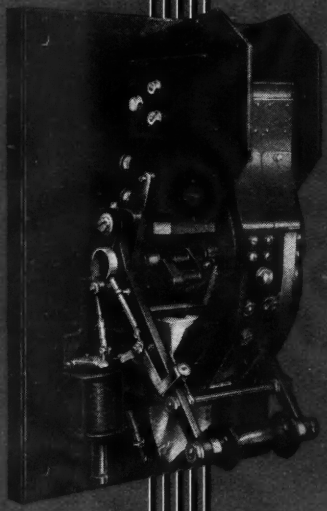

Renowned for their reliability
ASHTON
Cables and Flexibles
MADE BY
AERIALITE LTD.
CASTLE WORKS, STALYBRIDGE, CHESHIRE, ENGLAND

Air Break
CIRCUIT BREAKERS

A.C. or D.C.
up to 600v.



Our accumulated experience of nearly 50 years' successful Switchgear manufacture is behind the design of every Statter Air Break Circuit Breaker. Many thousands of Statter Circuit Breakers installed on land and sea in all parts of the World are giving exemplary service.

STATTER

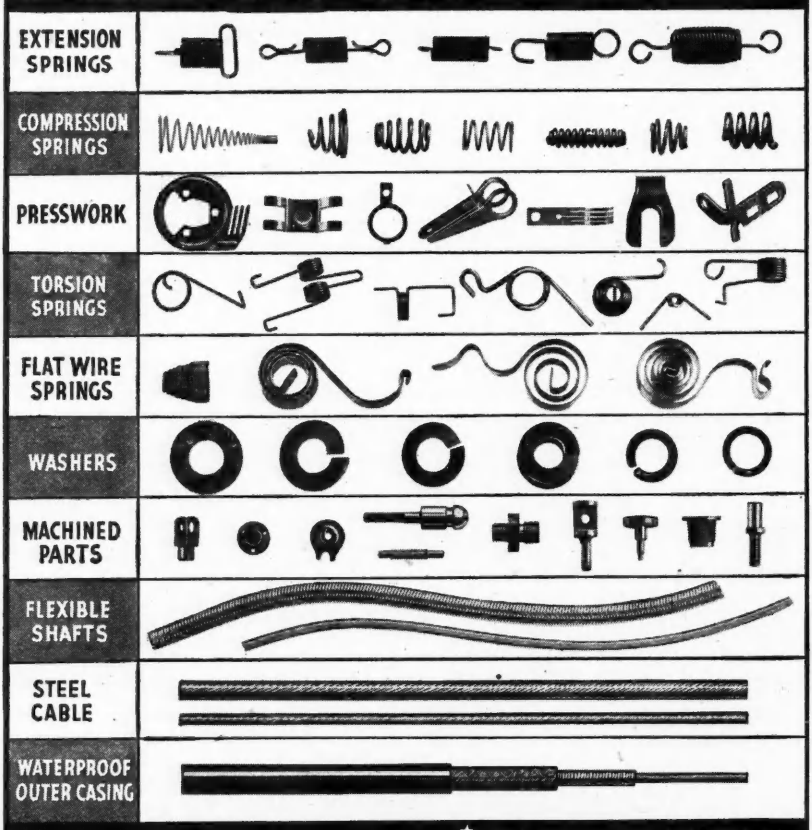
J. G. STATTER & CO. LTD., 82 VICTORIA STREET, S.W.1

sawell advertising

UNDER ONE ROOF..

Daily there flows a never-ending stream of immensely varied precision products from underneath the roof tree of "TERRYS OF REDDITCH." Below is shown a tiny cross-section . . . to list and illustrate them all would be a difficult task.

From a featherweight tiny watch spring to a powerful brake cable . . . from a gramophone needle to a pressed steel spanner, Terry's make them all, in all shapes and sizes. They can help you with your spring or presswork problem.
Write for a copy of their wartime catalogue

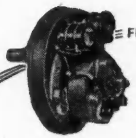


TERRY'S of REDDITCH

★MOTOR & MOTOR CYCLE TOOLS · ACCESSORIES ALSO DOMESTIC ACCESSORIES

ESTABLISHED · 1855

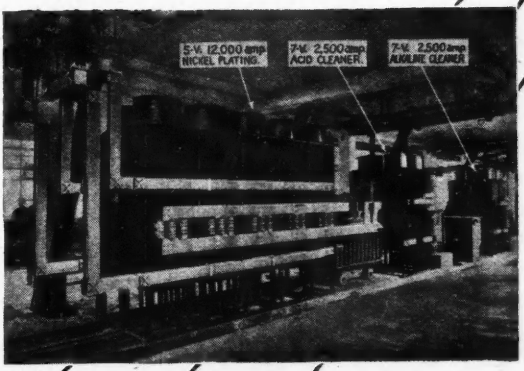
HERBERT TERRY & SONS LTD., REDDITCH • *Also at London, Birmingham and Manchester*



FROM MICROWATTS

WESTINGHOUSE METAL RECTIFIERS

Westinghouse Metal Rectifiers are made for numerous purposes with outputs ranging from microwatts, such as are required for measuring instruments, up to many kilowatts, as in the lower picture, which shows part of an equipment with a total output of 33,500 amperes for electro-deposition power supply, the rectifiers having now been in use for over 7 years—ample proof of Westinghouse reliability.



TO KILOWATTS

At the moment, Westinghouse Metal Rectifiers are in very short supply, but remarkable progress has been, and is being, made in development, following continuous and intensive research, and, with the return to normal conditions, the benefits of these improvements will be made available to our many good friends whose needs we are at present unable to meet.

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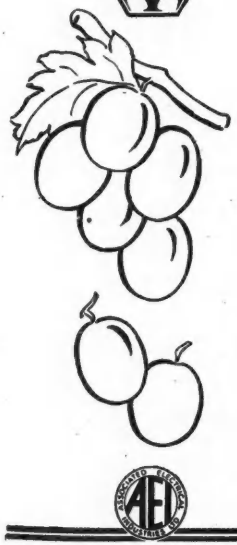

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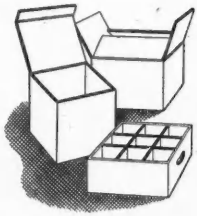

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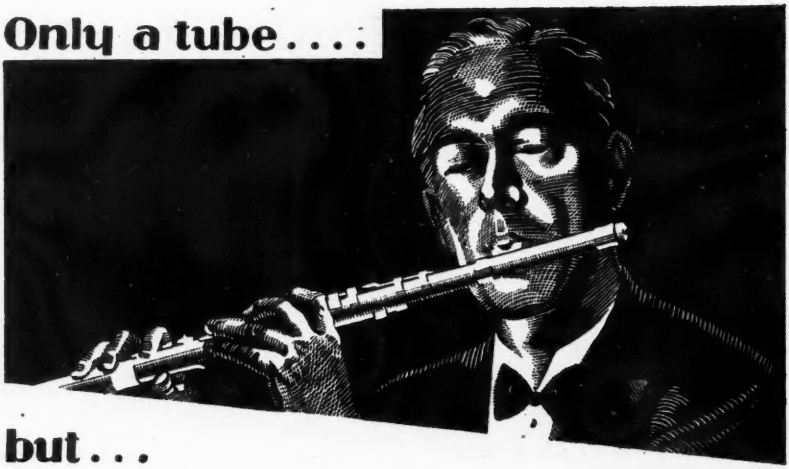

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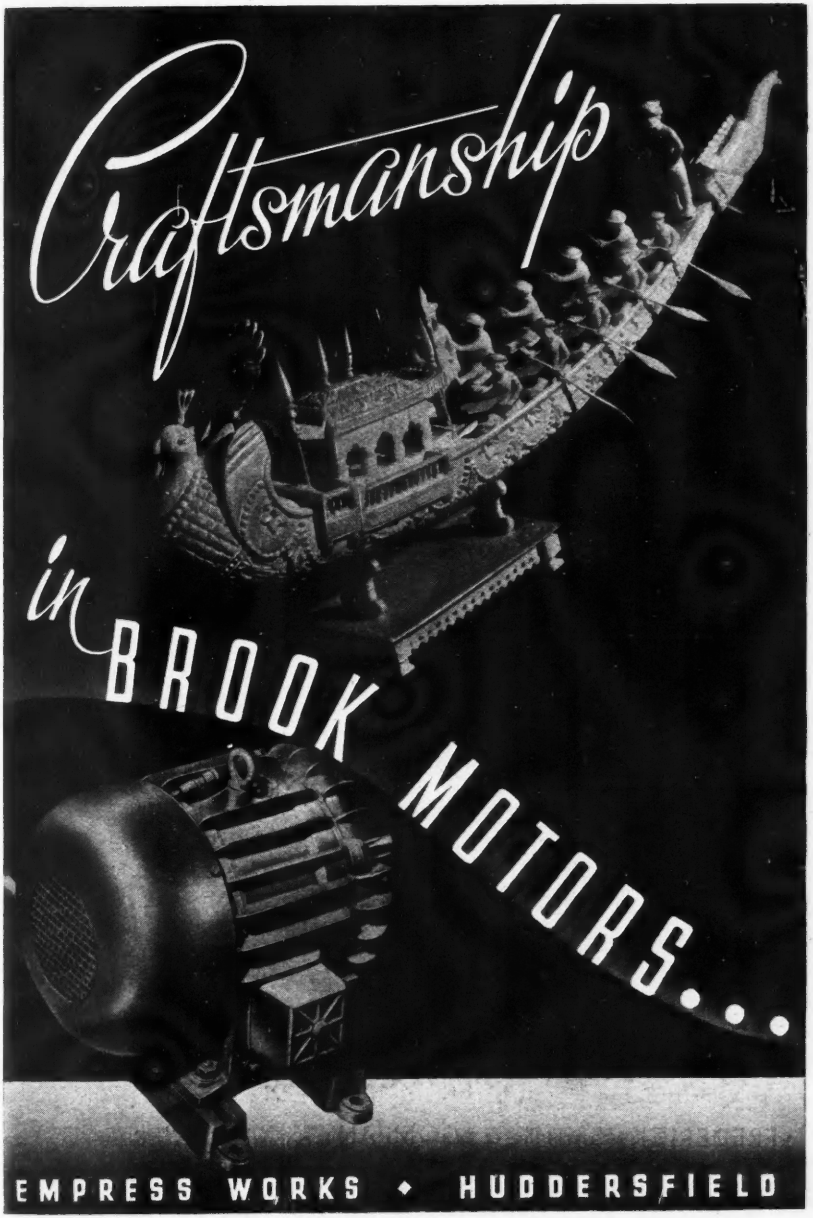
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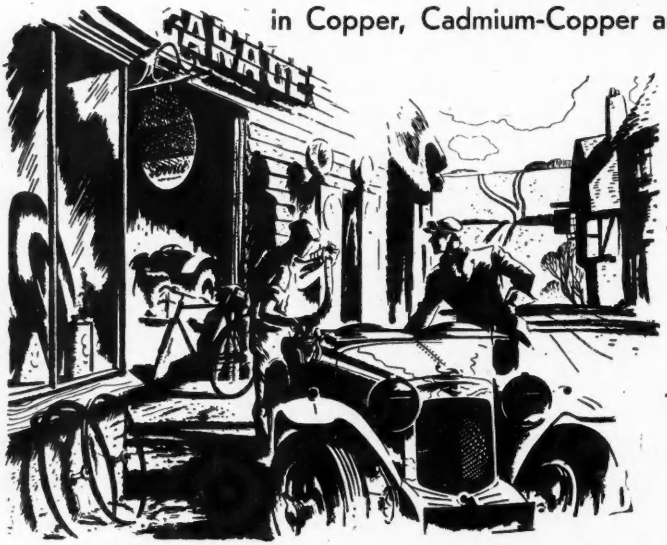

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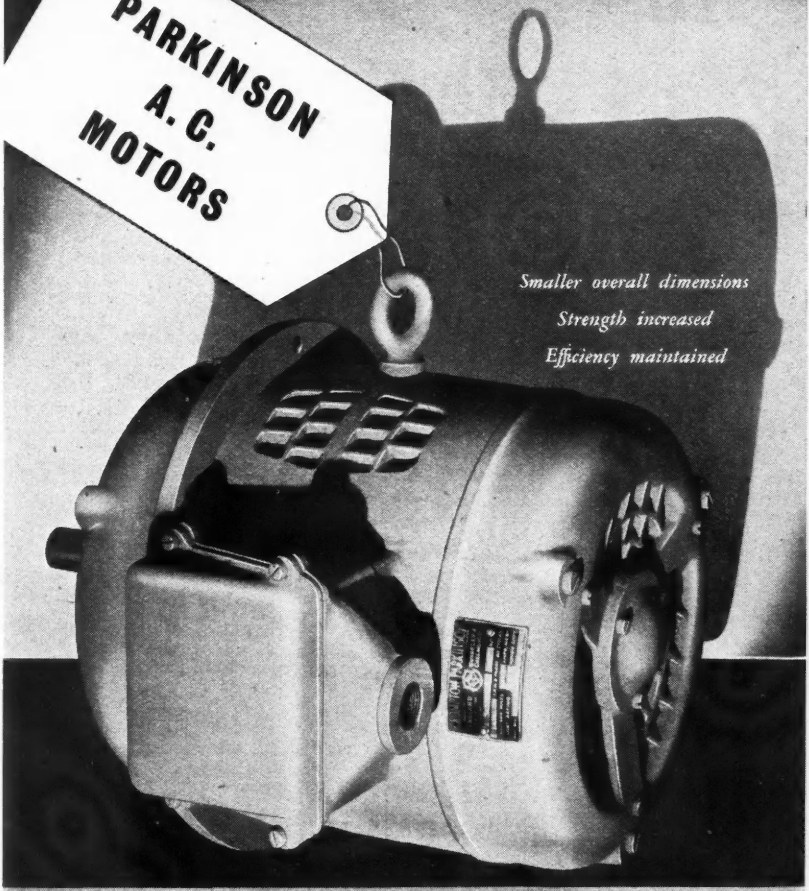

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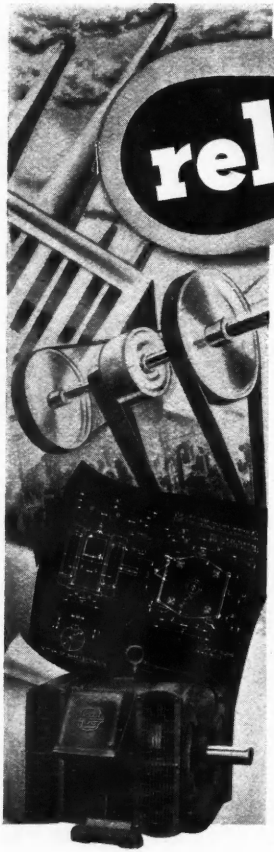

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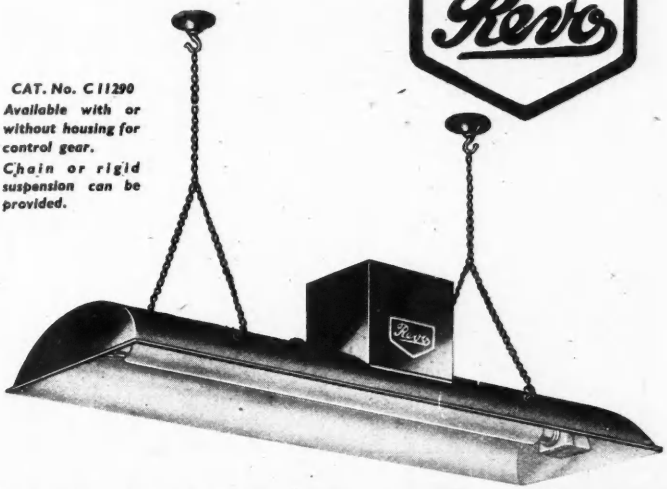

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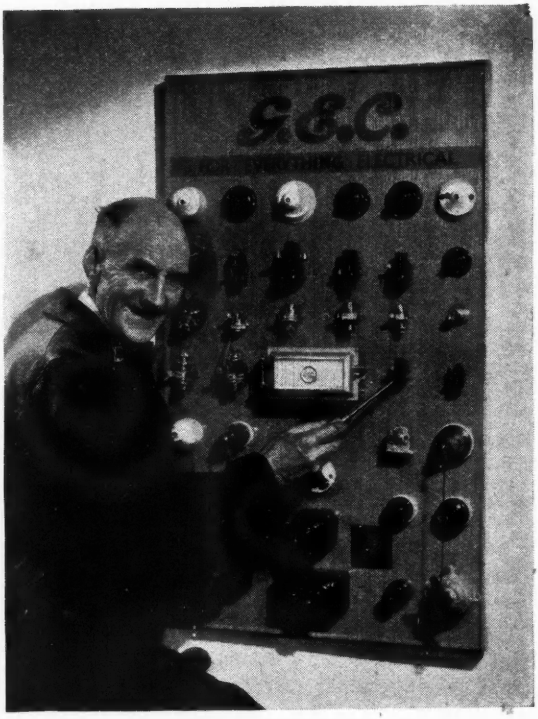

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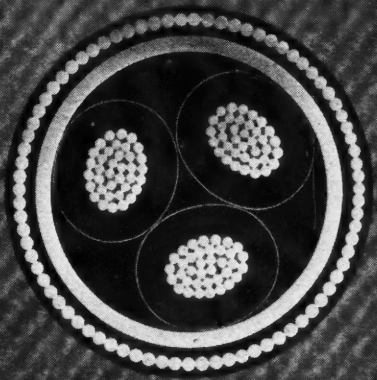

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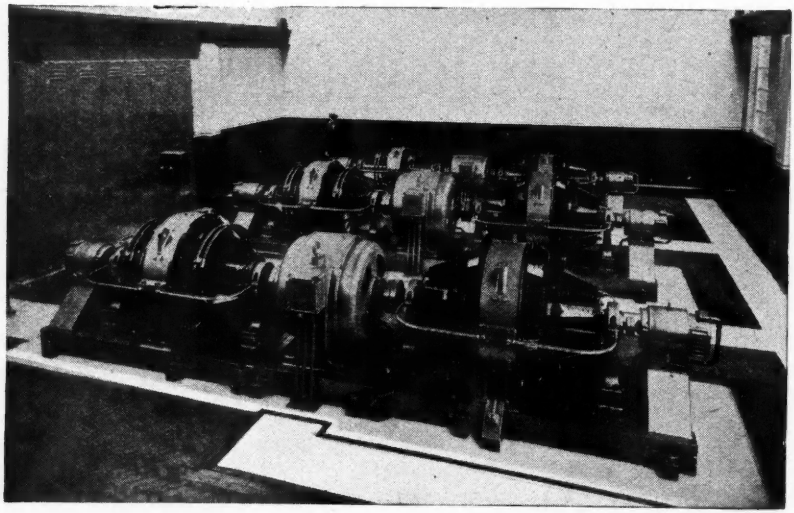

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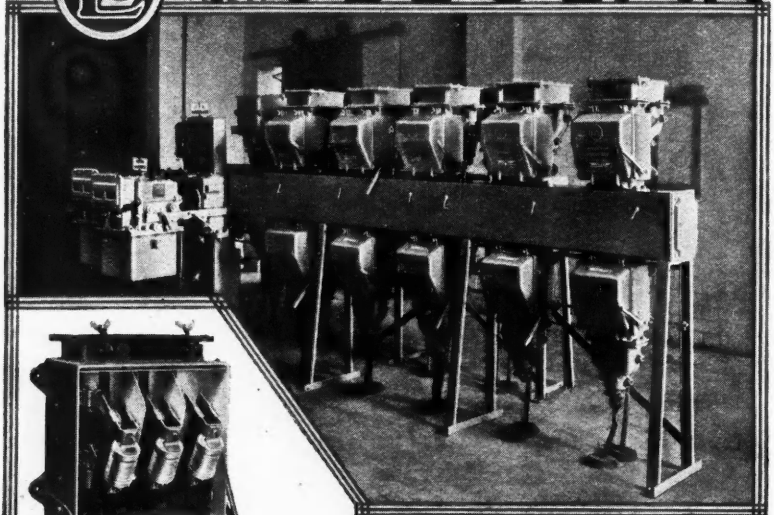

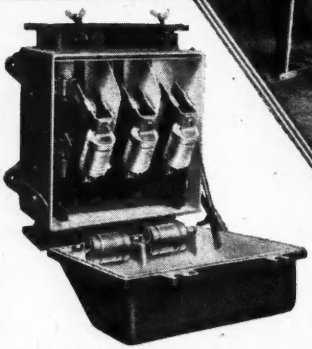

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— STAFFORD —

ELECTRICAL REVIEW

Volume CXXXI — No. 3372

Friday, July 10, 1942

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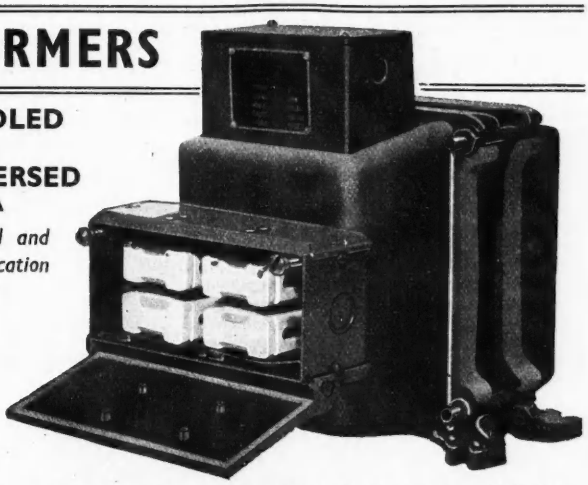

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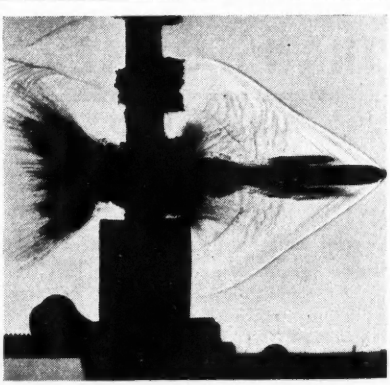

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ELECTRICAL REVIEW

THE OLDEST ELECTRICAL PAPER — ESTABLISHED 1872

Vol. CXXXI. No. 3372. JULY 10, 1942 6d. WEEKLY

Production and Export

Size as a Measure of Efficiency

AS we anticipated, the article by Mr. G. F. Sills in the *Electrical Review* of June 6th was a challenge which could not fail to summon up champions of the smaller firms. Mr. Sills contended that only large units could meet the conditions which would face the electrical manufacturing industry after the war, particularly when it came to recovering our export trade. He also drew attention to the virtues possessed by large groups, stating, or implying, that lesser concerns could not, by their very nature, hope to rise to the same plane.

Basis for Discussion

It was a frankly partisan statement and our main object in accepting it for publication was to provide a basis for the discussion of a very interesting, intricate and important subject. It was not a reflection of our own views, although it was not entirely in conflict with them. In a matter of this kind we are compelled to take up the attitude of Sir Roger de Coverley—"that there is much to be said on both sides."

There are many living examples (both positive and negative) of the truism that efficiency does not necessarily increase with size. It is equally true that some undertakings can be carried out only by concerns with substantial resources in finance, equipment and organisation. But such undertakings may be few and insufficient to keep the large concerns in continuous production. These concerns are accordingly forced to take up smaller work and it is in this direction that competition arises with the smaller more or less "specialist" firms.

The question is then raised whether with all their resources the large concerns are able to produce equipment and appliances cheaper or better (or both) than the smaller ones and at the same time whether they can provide superior conditions for their employees. Most of those who have commented on Mr. Sills' article have denied that the mammoth group has a monopoly of the advantages. They have said that efficiency is fostered by the more personal relationships existing in the smaller unit and this, combined with a closer interest in the work, is likely to benefit employer, employee and community alike.

Some Not so Small

Only one correspondent has raised the question of definition: what is a small firm and when does it become a big one? And only one has suggested that there can be medium-sized companies which belong to neither class, but actually form a substantial section of the industry. Mr. Sills mentioned four groups, but apart from these there are a dozen or so companies with issued capitals of over a million pounds (about half of them cable makers) and a similar number between £500,000 and £1,000,000; in the £250,000–£500,000 range there are about twenty.

In the past the established companies—small, medium and large—have all contributed towards the remarkable progress

which the electrical industry has made and most of them have had their financial reward. The war has only temporarily checked that progress ; afterwards the scope will still be tremendous. It is to be hoped that efficiency and service to the community, not mere size, will be the test for survival of individual electrical manufacturing concerns. This does not rule out the possibility of voluntary co-operation between them, both through their trade associations and otherwise, a question that is deserving of special consideration.

The Associate Grade

MANY men who rightly claim to be electrical engineers find themselves unable to take the examination entailed in acquiring associate membership of a chartered institution. It was to meet such cases that the grade of Associate was reconstituted by the I.E.E. some years ago. Before then the technical qualifications required for this grade were not what they are to-day and possibly on that account its present status is sometimes not properly appreciated. To have held a responsible position as an electrical engineer for five years implies an uncommon ability to make full use of one's theoretical knowledge. To be classed with men of this calibre as an Associate is surely an honourable distinction.

Manufacturing in Argentina

ONE anticipated result of the war is the industrialisation of countries which hitherto have been mainly primary producers. Brazil is one example and much progress appears to have been made there in the establishment of manufacturing industries. Argentina is also tending that way and the matter was recently discussed in an article in the Buenos Aires *British Chamber of Commerce Monthly Journal*. While it is agreed that headway has been made by various industrial enterprises it seems to be likely that many years must elapse before the Republic possesses a stable industrial system with production on a truly economic basis. It is agreed, however, that the days when raw materials were exported and eventually returned as manufactured products have passed, if not for ever, for many years to come. It may be noted that in 1941 only five companies were registered in the "Electricity, X-rays and Scientific Instruments" class.

Electrical Retailing

IN its third report (*Electrical Review*, July 3rd) the Retail Trade Committee recognised that electrical retailing was of a very different character from most retail businesses although it is clear that the Committee did not quite appreciate *how* different. The normal electrical retail field, it said, had been "largely invaded by contractors, builders and utility companies." Electrical contractors will be in agreement with the last part of this dictum but, as the original electrical retailers, will resent the application of the term "invaded" to themselves. And the Committee was apparently not told of the department stores and (dare we say it?) ironmongers who have taken a very large slice of the business in electrical appliances.

The "Dividing Line"

IN existing circumstances it is probably correct, as the Committee said, that many contractors are too busily engaged in installation work to worry much about the retailing of appliances, although the scarcity of these appliances is an important factor. There was no recognition by the Committee of the prior right of the electrical contractor-retailer to sell appliances although it was "advised that the two sides of the electrical contractors' business are intimately interconnected." Yet it was thought that "the dividing line is a matter of discussion between the Authority [*i.e.*, the body appointed to administer the concentration scheme] and the traders." But before pursuing this intricate subject further we must await the comments of the Electrical Contractors' Association on the scheme.

Good Work

AFTER more than a year and a half we are permitted to report a fact which was already fairly widely known : that the Central Telegraph Office, London, was totally destroyed by fire in the heavy air raid on December 29th, 1940. This "release," though long delayed, gives us an opportunity of paying a tribute to the Post Office Engineering Department and the operating staff by whose efforts the service was fully restored in alternative accommodation in less than three weeks. It is a "high spot" in the Post Office's long record of distinguished service.

Electrical Balancing Machines

Principles and Description of Different Types

By S. F. Philpott, M.I.E.E.

WHEN there is a greater weight in one section of a rotating body than in another, the centre of rotation and the centre of gravity do not coincide, and the centrifugal force of the unbalanced portion gives a whirling effect. Causes of unbalance include unmachined portions in which the metal content may vary, windings lacking concentricity and windings or parts inherently out of mechanical balance.

The process of balancing consists of finding the position and the amount of the unbalance and then adding or removing metal of relatively similar amount and in the opposite position to counterbalance it, thus bringing the centre of gravity back into line with the centre of rotation.

One of the most important processes in the manufacture of electric motors, or any other machinery running at relatively high speed, is the elimination of unbalance in the rotating parts. In this article electrical methods of quickly and accurately determining the position and extent of such unbalance are dealt with.

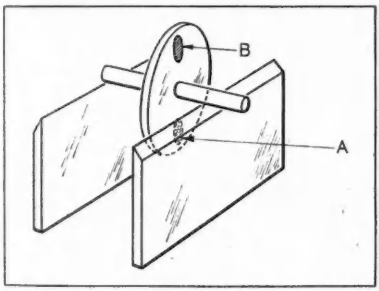


Fig. 1—Principle of static balancing

The simplest example of static balancing is illustrated in fig. 1. A disc with a heavy shot, A, placed on a pair of parallel strips or knife edges will roll to and fro and finally settle with A at the bottom. If now a similar weight is applied at the same distance from the centre on the opposite side, as at B, the disc will remain stationary.

With parts such as armatures and rotors that are relatively long in proportion to their diameter, however, such a balance on parallel strips provides no criterion for vibrationless operation. Referring to fig. 2, A represents an armature having an out-of-balance portion, C, which is shown at the extreme end of the core, although in practice the point of unbalance cannot be seen. If the unbalance were corrected on parallel strips the correcting weight could be placed at D and, as this is diametrically opposite C, the armature would be in static balance as seen from the end view. However, when the armature rotates, a mechanical couple will be set up, and weights C and D would tend to be thrown in opposite directions, the whole armature tending to pivot about point E in dynamic unbalance.

Dynamic unbalance, being the result of a mechanical couple, can only be located while the armature is being run at speed and can be corrected only by the introduction of an equivalent and opposing couple at F and G.

The working principle of the dynamic balancing machine is illustrated in fig. 3 where A is a rotor supported in bearings B which are mounted on a frame C pivoted at D near one end, and supported at the other on spring E.

If the rotor is run up to speed by means of the motor flexibly coupled to it, the frame C will oscillate due to the unbalance of the rotor. Instruments F and G indicate the amount and the angular position respectively of the weight H which must be added in plane *yy* to set the rotor in balance and so neutralise all vibration. The armature is then turned round, or the pivot moved so that plane *yy* becomes opposite the pivot, and the process is

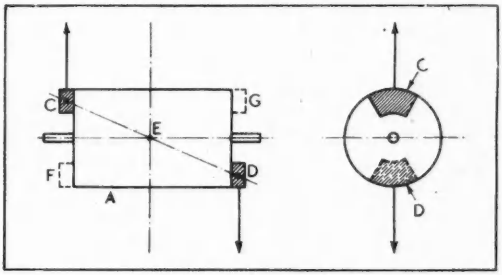


Fig. 2—Principle of dynamic balancing

subsequently repeated in respect of plane *x.x.*

In brief, the machine resolves all the unseen and unknown unbalances, wherever located in the body of the rotor, into two weights added in two arbitrarily selected planes, and the couple thus produced is equal and opposite to that produced by the unbalanced forces. The function of the dynamic balancing machine is thus to indicate the *position* of the unbalance and its *amount* in each of the preselected balancing planes. It does not balance the work.

Electrical methods of indication have contributed greatly to the speed and accuracy of balancing. It is generally unnecessary to add weights to the armature during the balancing operation until all the readings have been taken, and this is frequently done as a separate operation away from the machine.

An example of a machine in which the unbalance of the part on test is compensated for by an equal and opposite unbalance created during running by the operator is the Olsen Type "S" machine (Edmund G. Herbert, Ltd.). The work to be balanced is placed on rollers B (fig. 4) supported on a vibratory cradle D and is coupled to the driving pulley J on the main spindle, which is belt-driven by an electric motor, and to the compensator.

The two planes in which corrections are to be made are selected to suit the part, and the pivot-locking stands H are adjustable along the base so that they come opposite the balancing planes. Only one pivot is used at a time, either being selected as required by operating levers L. The vibratory cradle is provided with contacts which control the primary winding of a high-voltage transformer and cause sparks to pass between the end of the pointer M, which rotates in synchronism with the work, and the outer ring of the dial N. The angular position at which the spark occurs indicates the position of the unbalance—a first indication of the amount of unbalance being obtained by observing the angle covered by the sparking.

The compensating weight is adjusted until the single spark is diametrically opposite the centre of the unbalance arc. The *position* of the unbalance is then indicated by the position of the spark, and the weight is varied in magnitude until the "unbalance" spark either disappears or shows as a scattered spark all round the dial. This indicates that the moment of the created unbalance is equal and opposite to the moment of the unbalance in the part and the cradle has ceased to vibrate. The machine is then stopped and the amount of the compensator unbalance is read directly from the compensator barrel, which is usually calibrated in ounce-inches.

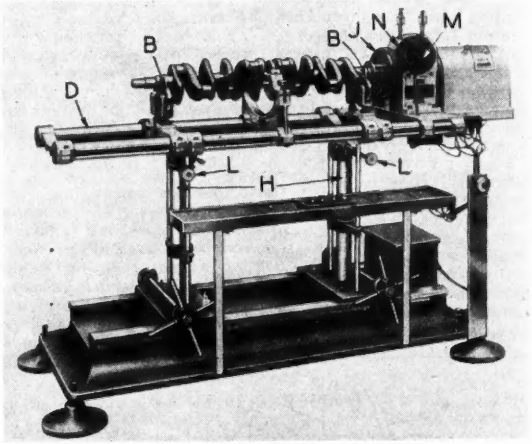


Fig. 4.—Olsen Type "S" balancing machine

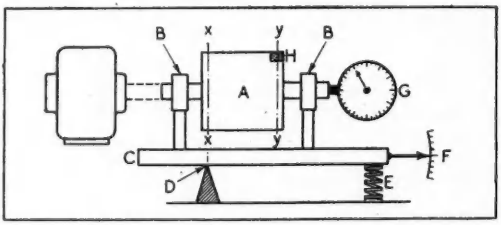


Fig. 3.—Working principle of dynamic balancing machine

The balancing machine illustrated in fig. 5 (Olsen Type "EO") differs in principle from that described above. It is designed for rapid production balancing of small parts such as vacuum cleaner, fan and similar armatures. E is an armature supported on roller bearings B, mounted on the cradle D which is pivoted on one or other of the brackets H, these being adjustable to the desired planes of correction. Only one pivot is used at a time, and a quick-acting device operated by knob L enables either to be brought into action instantaneously. The meter A indicates the magnitude of the

unbalance while pointer M indicates its angular position.

A small permanent magnet is secured at each end of the balancing cradle and moves, under the vibratory motion of the cradle, within coils U which are fixed to the bed of the machine. AC is generated in the coils proportionate to the vibration and hence to the unbalance to be measured, and is indicated directly by meter A. The scale reads 0–100 and there are four ranges of sensitivity. A chart can be prepared for each different size or weight of part connecting scale reading with corresponding ounce-inches, depth of drilling, inches of solder or any other convenient units. The phase relationship between the generated AC and the rotation of the part being balanced indicates the angle of unbalance. The AC is rectified by a cam-type commutator located in the headstock. The operating cam revolves in synchronism with the part being balanced. This cam has two separate dowels 180 deg. long; thus each set of contacts remains closed for 180 deg. alternately.

All the contacts are mounted on a commutator block which can be rotated by turning knob N. In operation the commutator is first turned until the meter reading is zero; the angle indicated on the dial then gives the *angle* of unbalance. The commutator is then turned through 90 deg, when the meter will read its maximum value—the reading being proportionate to the *amount* of unbalance.

A machine in which the *amount* of unbalance is shown on a meter while its *position* is indicated stroboscopically is the Gisholt

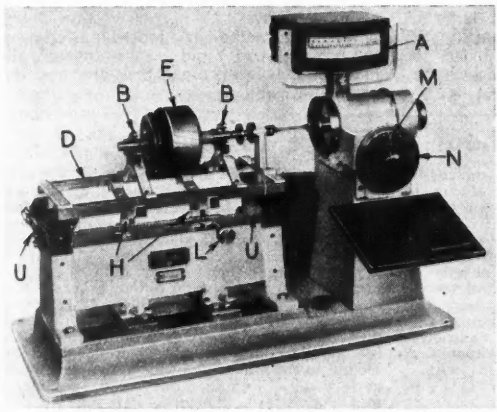


Fig. 5.—Olsen Type "EO" balancing machine

(Burton, Griffiths & Co., Ltd.) illustrated in fig. 6. The part to be balanced is supported on flexibly mounted bearings at A and B (fig. 7) and is belt-driven by an electric motor.

Attached to the bearing supports are coils which move in the field of powerful permanent

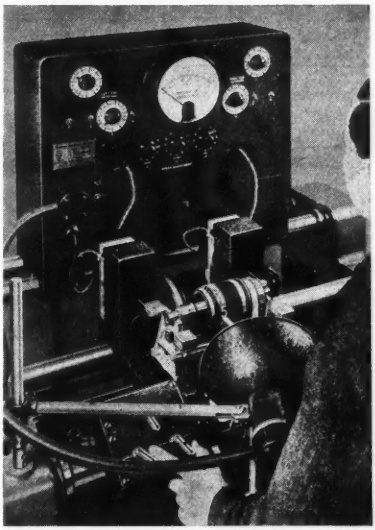


Fig. 6.—Gisholt Type "S" balancing machine

magnets. The vibration of the supports due to the unbalance causes voltages proportionate to the amount of vibration to be generated in the coils. Assuming for the moment that the only unbalance is W_2, rotation of the work will cause a large motion of the support B, and will cause to be generated a correspondingly large voltage b_2 by the coil associated with it. The lesser motion of the support A will cause a smaller voltage a_2 to be generated in the left-hand coil. By means of the voltage divider K a portion of b_2 may be chosen which will be equal to a_2 but opposite in value, so that the resultant voltage "V" will be zero due to unbalances of any magnitude in plane *yy*.

If now unbalance W_1 in plane *xx* is considered, a large voltage a_2 will be generated due to the large vibration of support A, and the small motion of support B will generate only a small voltage at that end. Now if the voltage a_2 and a small part of the voltage b_2 be added there will be a definite voltage "V" due to unbalance W_1 with no effect from

unbalance W_2. In other words, plane 2 becomes an electrical equivalent of the pivotal plane in the machines previously described. The voltage is amplified by M and the output fed to meter T which is calibrated in practical units, *e.g.*, depth of drilling, length of solder, etc. The meter is claimed to be sensitive to a vibration movement as small as 0·000025 in.

The angular location of the unbalance W_1 is determined by the stroboscopic lamp L which is so arranged that that portion of the body being balanced which appears to stand still in front of the lamp indicates the location of the unbalance correction.

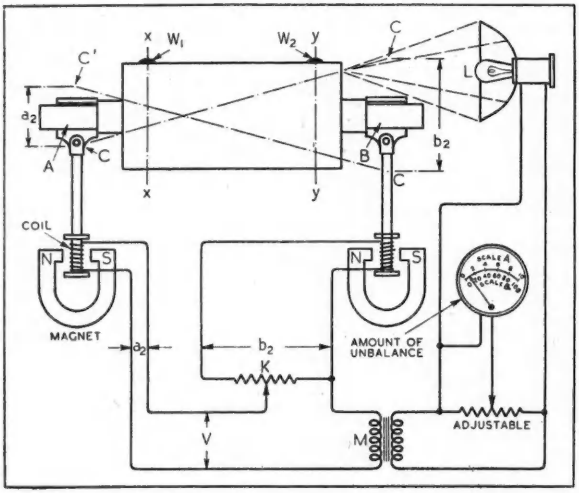


Fig. 7.—Fundamental electrical circuit of Gisholt balancing machine

Identification of the location is made easy if a band of paper or other material with numerals printed upon it is slipped over the work before commencing to balance. The operator has then only to record a number: the band remains in place until the permanent weights are attached.

From the foregoing descriptions it is seen that the function of the balancing machine is confined to indicating the amount and the angular position of the unbalance. The actual application of the corrective weights is a separate process, and provision must be made in the design of the armature or other part for the speedy and accurate attachment of suitable weights.

Common methods of applying balancing means are the insertion of metal weights of suitable section in the tops of the armature slots, depositing "blobs" of solder of known weight on the banding wires of armatures, drilling holes in rotors, fans (in the diametrically opposite position to that at which weight would be added) or the attachment of weights to specially provided balancing plates or grooves.

Whatever method is adopted it is essential to provide for rapid translation of the indications of the machine into practical units of weight.

Solving Labour Shortage Problems

TWO enterprising schemes just introduced by Partridge, Wilson & Co., Ltd., to overcome the present shortage of labour were described to us a few days ago by Mr. H. G. Wilson, managing director of the company. Encouraged by the success of utilising blind operatives, the company proposes shortly to take over half of a local blind school (40–50 girls) for coil winding, assembly and testing of transformers. Blind girls already employed in the company's factory have proved themselves exceptionally quick to learn and capable of undertaking most intricate operations with a surprisingly high degree of accuracy. One girl, for instance, whom we saw working a capstan lathe, can actually claim a higher output than the sighted operator whose place she took.

The other scheme aims at employing, purely for assembly work, part-time operatives recruited entirely from wives of serving Regular Army personnel stationed in the district. Premises, probably vacant showrooms, are to be taken over in a conveniently central locality and each vacancy will be covered by a team, which may consist of as many as four or five women. No restrictions will be placed on how the work is to be shared between them. All that is required is that they should hold themselves responsible for seeing that one or other of them is at work during the whole of the 12-hour day.

Training will occupy a month, the first fortnight being devoted to general training in the use of tools and assembly methods, and the second to the practising of the actual work to be performed. Remuneration will commence immediately training begins. Part-time workers, between thirty and forty of them, are already employed at the company's factory. In this case, however, the splitting up of the work is restricted to two women only on account of training considerations which for a larger number would be difficult and uneconomical.

Current-Transformer Errors

Measurement by an Exciting-Current Method

By G. F. Freeman,
M.Sc.(Eng.), A.M.I.E.E., A.M.I.Mech.E.

ON the assumption that a current transformer has no leakage flux, which is substantially true for ring cores, the errors are wholly due to exciting current, which in turn depends upon secondary winding resistance, burden impedance and fractional load. Ratio error but not phase error for a normal burden may be compensated for by a slight reduction in secondary turns.

This analysis ignores capacitance effects, which is usually permissible. By open-circuiting the primary winding, exciting the secondary winding to produce a flux appropriate to the burden, and measuring the exciting current demanded, the errors may thus be closely approximated. Secondary winding resistance is easily obtained by a DC measurement; turn ratio, which must be known, can be deduced from an alternative test or by reference to manufacturers' data. It would be a convenience if the turns were stated on the nameplate, but this is not at present common practice.

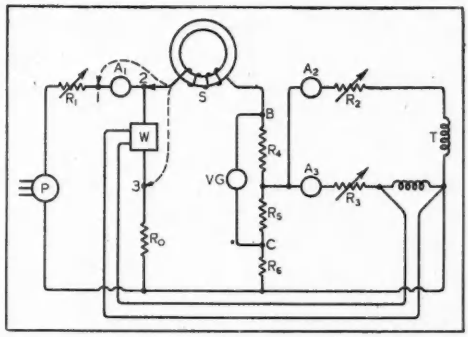
In the diagram, current is supplied from a phase shifter P (*e.g.*, the wound rotor of a stationary induction motor) to a series circuit comprising a rheostat R_1, an ammeter A_1, the current coil of a wattmeter W and a non-inductive resistamce R_0 equal to that of the secondary winding S at working temperature. This winding is shunted across a portion of the circuit consistent with the stipulated burden; thus, connection (1) gives (A_1+W), (2) gives W only and (3) gives zero. Other components may be interposed between W and R_0 as desired. The transformer will be correctly fluxed provided that the potential difference between the points B and C is zero and the drop caused by the exciting current in S is compensated for by an equivalent negative drop in the small resistance R_6.

These conditions can be simultaneously satisfied if R_8 is made equal to $(R_0R_5)/R_4$. The "backing circuit" BC thus comprises the resistances R_4, R_5 and R_6 in series. Auxiliary currents flowing in R_5 and R_6 derive from a two-phase, three-wire source T synchronous with the main supply. When the vibration galvanometer VG (or other suitable indicator) denotes zero potential difference between B and C, the joint auxiliary current in R_5 and R_6 is in phase opposition to the exciting current, and exceeds it in the ratio $(R_4+R_5)/R_5$.

The volt connection to the wattmeter is used to orient the components; if P is adjusted so that W reads zero the ammeter A_2 will give the ratio error component and A_3 the phase error component, providing that the rheostats R_2 and R_3 are non-inductive and large enough to swamp the ammeter inductances. A_1 indicates either primary current (reduced to secondary turns) or secondary current according as it is outside or inside the burden; normally the difference is unimportant.

Applied to a 200 ampere-turn miniature nickel-iron ring transformer, rated at 0.5 secondary A (actual turns 397) and operating on a 6 Ω wattmeter burden, readings of 0.50A (A_1), 0.059A (A_2) and 0.0275A (A_3) were obtained. R_4, R_5, R_0 and R_6 were 95, 5, 3.8 and 0.2 ohms respectively. The ratio error is thus $\left(\frac{3}{400}-\frac{0.059}{0.50}\times\frac{5}{100}\right)\times 100$ per cent. = 0.16 per cent. high, and the phase error $\left(\frac{0.0275}{0.50}\times\frac{5}{100}\right)\times 3{,}430 = 9.5$ minutes lead.

An alternative determination on the identical apparatus, made by the more accurate method already described in the *Electrical Review* of December 15th, 1939, gave 0.145 per cent. high and 13 minutes lead, and corresponding agreement at other currents and burdens. Neither method requires precision instruments, ordinary ammeters (or voltmeters used as ammeters) being adequate since small *differences* are



Circuit diagram illustrating the method described, which does not require the use of precision instruments

being measured. In the method described in 1939 the turn ratio does not require to be known, but a second nickel-iron core (another transformer is suitable) is necessary.

Care must be taken that such control resistances as are required to be non-inductive fulfil this condition, the helix-on-iron-tube construction being inadmissible for R_2 and R_3, although quite suitable for R_1. Inductance may, however, exist in the backing circuit without detriment, providing only that the time constants of R_4 and R_5 are the same. R_6 is so small that its possible inductance is unlikely to be critical; it may in fact often be omitted altogether without noticeably affecting the balance.

Alteration of the gross resistance value affects of course the sensitivity of VG. It is possible to dispense with R_4 if the exciting current is large enough; in that case the value of R_5 (with R_6 omitted) need not be known and its time constant is immaterial; A_2 and A_3 are then direct reading, and the resultant current in R_5 at balance is zero.

A further obvious modification is to dispense with the second auxiliary phase and obtain balance by adjustment of R_2 and P only. The angle between the exciting and burden currents may then be gauged by the wattmeter reading at balance in terms of its possible maximum. The arrangement shown in the diagram does, however, give rather more flexibility, and is very convenient when P is at some little distance from the other apparatus, as once set it requires little or no subsequent adjustment.

There appears to be no objection to extending the method to cover wound-type transformers in which the leakage reactance has been determined by a short-circuit test. In such a case, R_0 should be augmented by X_0, equal to this reactance referred to secondary turns. This development, however, has not up to the present been investigated in detail. Strictly speaking, R_6 should be modified in the same proportion, but this is not considered likely to be of any real practical significance.

Work of the E.I.B.A.

Constructive Assistance

INSTANCES of the way in which, by studying individual cases, the Electrical Industries Benevolent Association has been able to give help of considerably greater value than the monetary assistance involved are cited in the annual report which was submitted to the annual general meeting held in London last Wednesday.

Mention is made of how a young clerical worker was stricken with tuberculosis, a disease which is unhappily on the increase again due to war conditions. Because of the nature of the complaint his widowed mother had to give up her means of livelihood, the keeping of a nursing home. The Association's first step was to make a weekly grant to cover the invalid's expenses while in a sanatorium. The military authorities who had commandeered the mother's home were then approached so that she at length obtained the payment of rent, delayed for over a year.

After the young man had left the sanatorium he was further assisted until he was fit to take a job and support himself at the level necessary to prevent a recurrence of the disease. To spare him worry the Association shouldered all the business of obtaining compensation for a houseful of furniture left in the commandeered premises and "lost" by the authorities. A special grant was also made so that he could send his mother, whose health had meanwhile broken down, away for a holiday.

This and other cases illustrate the Association's contention that mere money-granting is a soul-destroying process and that the final aim is to help the people to help themselves.

During the year some 400 people were assisted taking into account the wives, children and other dependants of the applicants. Of the actual 180 cases, continuous weekly allowances were made to 109 throughout the year. Because of the individual consideration given, the Relief Committee and its branch committees had pondered and dealt with more than 1,000 agenda items. The total amount paid out in cash to beneficiaries was £8,639, or £352 more than in 1940. Two new branch Committees were inaugurated, in Ayrshire and West Middlesex.

The accounts, subject to audit, reveal a charitable income, after allowing for reserves, of £13,153, an increase of £520, but the increase in total income is only £424, due to the lower yield from investments. The figure for advisory, after-care and other services and administration shows a small increase of £90, but is £274 less than in 1939. The amount carried to the balance sheet is £11 less than in 1940.

Large Contributions

The report records with gratitude twenty-three gifts of upwards of a hundred pounds, and states that the organised collections by the E.C.A. and E.W.F. have continued. Members of the Cable Research Group and of the Provincial Electric Supply Association considerably increased their contributions, and B.E.A.M.A. organised a collection among its members which largely contributed to the satisfactory financial position.

Growing support is also being received from local authorities and from other quarters. It is stressed, however, that still further help is needed to maintain the growth of the Association's work and to balance losses through many subscribers being called to the Forces.

As we have already reported, Mr. E. E. Hoadley, borough electrical engineer, Maidstone, has succeeded Mr. P. V. Hunter (Callender's) as president of the Association.

Voltage Regulators

Principles of Control

MOST automatic voltage regulators, either "on-load" tap changers on transformers or separate boosters, are of the "step-by-step" type. When the voltage varies from the normal by an amount equal to the sensitivity of the voltage governor, a tap-change is initiated which corrects the voltage by an amount equal to one step of the regulator. After this adjustment has been made the governor must open its contact, otherwise a second step will be made immediately and, further, it must not close its contacts for a reverse operation that would cause the gear to move backwards and forwards continually on a steady incoming voltage.

Thus the change in voltage necessary to open the contacts from that required to close them must be less than the voltage of one step of the regulator, while the total sensitivity must be greater than the voltage of one step.

The circuit voltage to be regulated to, say 230 V, is represented (fig. 1) by the smooth curve V varying 10 per cent. between times of light and heavy loads and curves 1, 1½ and 2 represent the output voltages which would be provided, on the assumption that the regulator makes 1½ per cent. steps and is instantaneous in action. Curve 1 is plotted for a governor sensitivity of plus and minus 1 per cent. and curves 1½ and 2 of 1½ and 2½ per cent. respectively.

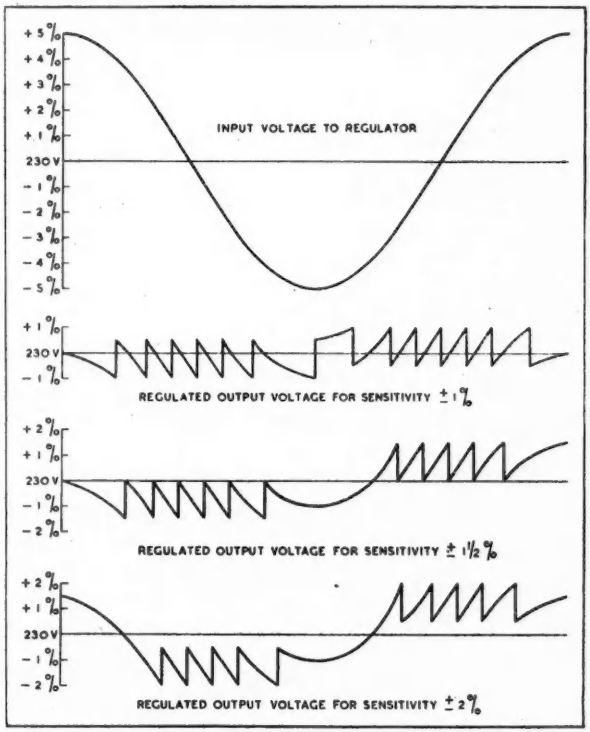


Fig. 1.—Effect of the sensitivity of the governor on the regulated voltage

Actually, the alteration in voltage with the changing load conditions would be much steeper and there would be fluctuations upon the mean curve during the load-cycle, but the diagram emphasises that, if the governor is adjusted with a low sensitivity, there will be a tendency for the apparatus to keep the mean regulated voltage below the desired normal value during the heavy load period, and on the high side at times of light load. The greater the sensitivity the more marked will be the response of the gear to fluctuations of the mean voltage, which would cause the gear to operate more often than is necessary. So, compromising between these two aims, the optimum setting of a governor may be defined as a sensitivity equal to ± the value of one regulator step.

It is uneconomical to allow a change to be initiated by a voltage fluctuation which may have passed by the time it is corrected. The principal purpose of the time delay device is therefore to prevent unnecessary tap-changes

and it should be set with this end in view, and with reference to the characteristics of the particular supply being regulated. Generally, a delay of from 30 to 45 seconds is effective.

Compensation is often provided to increase the output voltage with increasing throughput of the regulator in order to allow for increasing voltage drop in feeders and distributors due to their impedance. One simple method is to use a phantom circuit (fig. 2) composed of an adjustable resistance and reactance and to pass through this circuit a current proportional to the load. The voltage thereby produced across the phantom circuit opposes the voltage applied to the governor circuit. The regulator has, therefore, to increase the output voltage to a value equal to the vectorial sum of the drop across the phantom circuit and the balance voltage of the governor, before the latter takes up the balanced position. The value of resistance and reactance in use is usually made adjustable by means of multi-stud switches marked in percentages.

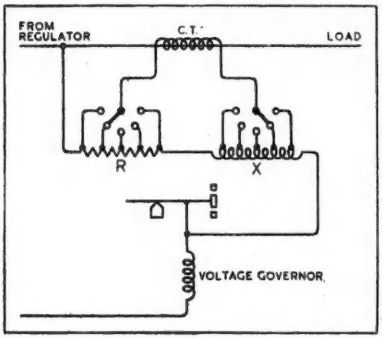


Fig. 2.—Phantom circuit for line-voltage drop compensation

This method of compensation automatically takes account of changing power factor and, in effect, maintains within the limits of the regulator constant voltage under all conditions of loading at the remote end of a feeder having a resistance and reactance equal to those at which the controls

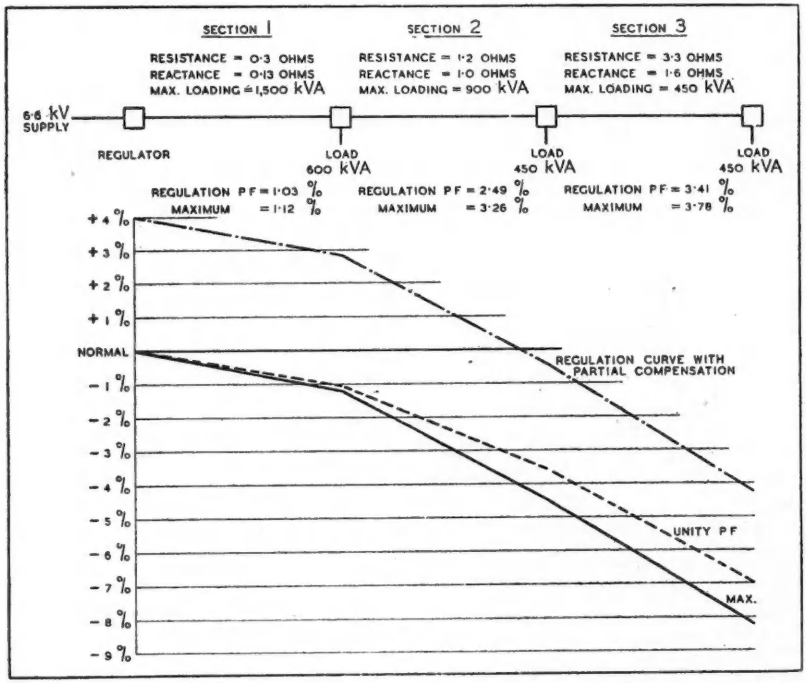


Fig. 3.—Voltage drop along hypothetical distributor with three sections having different characteristics

are set, on the assumption that all the load on the feeder is taken at the remote end. Such conditions seldom occur in practice; the load is distributed and, often, the feeder is composed of sections having different characteristics.

To decide the best settings of the resistance and reactance adjustments, it is necessary to consider the whole circuit being regulated and to estimate the voltage drops which occur at the period of maximum total loading. If this information is set out in the form of a graph it will be simple to decide what increase of voltage is necessary at the regulator terminals to maintain the minimum departure from the correct voltages at the more important points of the distributor under load and to set the control accordingly.

Line drop compensation is concerned only with the circuit on the output side of the regulator, as the governor takes care of voltage variations on the incoming supply. Consequently in fig. 3 the regulator is shown at the supply point of the distributor. This diagram represents the voltage drop along a hypothetical distributor having three sections of different characteristics with the load at the points and in the proportions indicated. The practical case will not be so simple, but, with certain permissible presumptions, it is generally possible to express it in some manageable form with sufficient accuracy.

Method of Calculation

The drop along each section is calculated from the characteristics and loading of the section, both for unity p.f. and for the p.f. which gives the maximum drop. These are obtained from

$$\text{Drop at p.f. unity } V = I\left(R + \frac{X^2}{200}\right)$$

$$\text{Max. drop } V = I\sqrt{R^2 + X^2}$$

where R is the resistance and X the reactance in ohms and I the load current of the section. For example, taking section 1 of the diagram, the current per line at 1,500 kVA is 131 A and the drops are

$$\text{At unity p.f.} = 131\left(0.3 + \frac{0.13^2}{200}\right) = 39.3 \text{ V}$$

$$\text{Max.} = 131\sqrt{0.3^2 + 0.13^2} = 42.9 \text{ V}$$

which expressed as a proportion of the line / neutral voltages are 1.03 and 1.12 per cent., respectively. The individual drops should then be summed vectorially and the total drops for the line ascertained. In the great majority of practical cases the arithmetical sum is quite sufficiently correct and again may conveniently be expressed as percentages, say D unity per cent. & D max. per cent.

To maintain the pressure at the far end of the circuit under load, the resistance and reactance adjustments should be set at values which in the above formulæ would give the total drops D unity & D max., but for practical purposes it is amply sufficient to set the resistance adjustment at D unity and the reactance at $\sqrt{D^2 \text{ max.} - D^2 \text{ unity}}$ %.

For partial compensation of the line drop such as shown in fig. 3, each adjustment should be set at the appropriate fraction of their full values: in other words, the ratio between the resistance and reactance components should be maintained and the settings for the above example would be resistance 4 per cent. and reactance 2.5 per cent. Thus the regulation of the line would be so adjusted that at the supply end the variation would be between normal and + 4 per cent., and at the remote end not less than — 4 per cent. approximately.

We are indebted to the British Electric Transformer Co., Ltd., Hayes, Middlesex, for the information contained in this article, and also for the drawings.

Swiss Railway Electrification

THE putting into commission on February 14th last of the twelve-mile electrified Seebach-Wettingen section of the Swiss Federal Railways is of historical as well as technical interest, as it was on this line that the pioneering work was done for main-line electrification in Switzerland.

From 1904 to 1909 Ateliers de Construction Oerlikon, at the instance of Dr. E. Hubar-Stockar, carried out trials on the AC, 15,000-V, 16⅔-cycle system (which was later adopted nationally), and was responsible for providing a regular service. The original locomotive was driven by two 250–HP motors and weighed 42 tons complete. Its normal speed was 25 m.p.h., and its maximum 37 m.p.h. During the last seventeen months of operation about 10.3 million gross ton-miles, representing 80,000 train-miles with an average gross weight of 128 tons, were dealt with. Single-phase consumption at the substation worked out at 49.2 Wh per gross ton-mile.

Although results in many respects exceeded expectations, the service was closed in 1909. The decision of the Swiss Federal Railways was apparently due to the consideration that the section would not be suitable for heavy high-speed locomotives (the use of which was considered desirable to justify permanent electrification) without incurring a large expenditure in strengthening the super-structure and understructure, which the then financial position of the Federal Railways did not permit.

In 1918, as a result of transport difficulties due to shortage of coal during the last war, a programme was drawn up for the electrification of the whole Federal Railway system within thirty years, the conversion being later accelerated. Up to the present some 1,330 miles, corresponding to 74.4 per cent. of the whole system, have been electrified. Expenditure amounted to 805 million fr. up to the end of 1940, during which year 94 per cent. of the total traffic was dealt with electrically. With steam traction about 1.2 million tons of coal would have been required, costing 120 million fr. These particulars are based on data published by the Swiss Federal Railways.

Manufacture and Supply

New Restrictions Next Month

THE President of the Board of Trade announced last week that the Limitation of Supplies procedure is being supplemented as from August 1st to eliminate the manufacture of further unessential goods and to secure economical production of others by simplification and standardisation; this will also facilitate the fixing of maximum prices. It is estimated that 30,000 workers will in this way be released for war industries.

In a memorandum setting out the proposals, Part A deals with classes of goods which will be subject to the Control of Manufacture and Supply Orders and whose manufacture after the beginning of next month will be permitted only under licence; in the case of firms employing less than five people the provisions will not apply until October 1st.

These goods include domestic electrical appliances, as follows:—Electric cooking, drying and heating apparatus (including curling irons, waving irons, hair wavers, hair dryers and hand dryers), electric dry shavers, irons, vacuum cleaners, motor-car heaters, lighters, health exercisers, drink mixers and electric fans with motors not exceeding 0.1 HP, but not including goods subject to the Machinery, Plant and Appliances (Control) Orders, 1942 (S.R. & O. Nos. 1 and 1175). Some of these goods are included in Class 17 of the Limitation of Supplies (Miscellaneous) Order. Electric space-heating apparatus is subject to the Limitation of Supplies (Heating Apparatus and Polishes) Order, 1942, which will still limit supplies of these goods. Licences will be granted at the general rate of 25 per cent. of pre-war supplies, but provision will have to be made for priority requirements. Except for space-heating apparatus manufacturers will be free until September 30th to dispose of the stocks of finished and semi-finished goods in their possession.

Revised Stipulations

It is emphasised (*a*) that manufacture and supply for export is not exempted from the licence requirement; (*b*) that no licence is needed for direct Government orders; and (*c*) that all manufacturers are subject to the licence requirement. Points (*a*) and (*c*) did not apply under the Limitation of Supplies Orders. There will be no control of supplies by wholesalers under these Orders except in the case of aluminium hollow-ware, the supply of which by wholesalers and manufacturers continues to be prohibited, and electric space-heating apparatus, where the existing restrictions will continue.

With their applications for licences manufacturers should send (to the Industries and Manufactures Department, 4, Board of Trade, Millbank, S.W.1) a catalogue or list specifying the items they wish to be allowed to make and indicating the value of their supplies of these goods over a recent period of not less than three months. Applications will not normally be entertained for the following:—Chafing dishes, cigar lighters, curling-tong heaters, electric teapots, toasters (domestic types), towel rails and heaters, egg boilers, hand dryers, milk heaters and porringers, motor-car heaters, coffee percolators, steamers (domestic types), waffle irons, warming plates, shavers, drying cabinets (domestic types), health exercisers, drink mixers, electric shaving pots and small immersion heaters.

Part B deals with goods whose manufacture is to be prohibited after August 1st, among them being certain types of glassware of a kind commonly used for domestic purposes and illuminating glassware; all glassware with applied decoration, including cut-glass, is covered. The goods form part of Class 8 of the Limitation of Supplies (Miscellaneous) Order, but from August 1st glassware, except permitted types of certain illuminating glassware, will not be subject to this Order.

Lighting Fittings

In Part C are set out the quotas under the Limitation of Supplies (Miscellaneous) Order after July 31st. Class 9 (*b*), Lighting Fittings: Quota of 10 per cent. by value of sales during the standard period on all goods included in this part of Class 9. Supplies by manufacturers of the following types, however, will be prohibited:—Bronzes, crystal fittings, candelabras and electroliers, including brackets to match and ceiling fittings of the electrolier type; lanterns for electric lighting; floor standards; shades, bowls and reflectors wholly or mainly of metal; shades, bowls and globes of any material decorated in any way, but not those sprayed with one colour or shades attached to a frame by braid; electric table lamps wholly or mainly of metal and other table lamps if decorated or ornamented in any way. Class 17 (Machinery) will be discontinued. Electrical domestic appliances, as already stated, will be subject to an Order controlling manufacture and supply, and other items are subject to the Machinery, Plant and Appliances (Control) Orders, 1942.

The quotas for polishes and heating apparatus under the Limitation of Supplies (Heating Apparatus and Polishes) Order will be continued at the same rate, except that electric space heaters will also be subject to an Order controlling manufacture.

Canadian and American Standards

We are informed by the British Standards Institution that the following Canadian and American Standards have recently been received: Canada (all CESA C22.2, 1942) :—No. 42 (revision).—receptacles, plugs and similar wiring devices ; No. 14.—industrial control equipment for use in ordinary (non-hazardous locations) 2nd edition ; No. 72.—construction and test of heating and heater elements replacement types ; No. 3.—construction and test of electrical equipment for oil-burning apparatus (2nd edition). U.S.A. :—NEMA 41–69.—magnet wire standards—supplement ; NEMA 41–70.—type letter designations of wire and cable. These standards may be inspected at, or obtained on loan from, the offices of the B.S.I., 28, Victoria Street, London, S.W.1.

A Comprehensive Tariff

Simplification Designed to Secure Satisfaction

By G. W. Smeed, B.Sc.(Eng.), A.M.I.E.E.

DIFFERENCES between supply authorities and the public on account of charges are often due not so much to the cost of electricity as to an unsuitable tariff.

A typical though hypothetical list of standard rates is given in column 3 of the table. Column 4 gives the maximum price of one kWh (at 1 kW demand). It will be noted that should the demand period be a quarter of an hour, one kWh could be recorded by 4 kW during that time and the equivalent cost on rate B1 would become £16 13s. 5d. —an unlikely but not impossible figure. Column 5 gives the minimum price of one additional kWh at any demand, while column 6 gives the minimum average price per kWh at any demand. The minimum average price under rate G depends, of course, on the fixed charge, but normally would be between ¾d. and 1d. per kWh.

The author suggests that a block tariff would be the most satisfactory for the purpose

Thus the apparent value of 1 kW in continuous use varies from just over ¾d. per kWh in the case of power (rates E1, E2 and E3)

1	2	3	4	5	6
A	Lighting	6d. per kWh	6d.	6d.	6d.
B1	,,	£4 3s. 4d. per kW per quarter, plus 1d. per kWh	£4 3s. 5d.	1d.	1.46d.
B2	,,	First 200 kWh per kW per quarter @ 6d., excess @ 1d.	6d.	1d.	1.46d.
C	Heating	2d. per kWh	2d.	2d.	2d.
D	Power	2d. per kWh	2d.	2d.	2d.
E1	,,	23s. per kW per quarter, plus ¾d. per kWh	£1 3s. 1d.	¾d.	¾d.
E2	,,	First 200 kWh per kW @ 2d., excess @ ¾d.	2d.	¾d.	¾d.
E3	,,	First 1,000 per quarter @ 2d., excess @ ¾d.	2d.	¾d.	¾d.
F	,, (Limited)	Limited-hour supply (off-peak) 1d. per kWh plus time-switch rental	T/S rental plus 1d.	1d.	1d.
G	Domestic rate	Fixed annual charge plus ½d. per kWh	Fixed charge plus ½d.	½d.	½d.

and, neglecting rate G, to a little under twice that sum for lighting (rates B1 and B2). Further, one additional kW for one hour over peak load, for instance, may have a value varying from a halfpenny (rate G) to £4 3s. 5d. (rate B1). Moreover, a continuous supply of energy may be obtained (E1, E2 and E3) at a lower average cost than on the limited service rate F, despite the conditions of "on-peak" and "off-peak" loads.

In view of the above and the fact that the use to which electrical energy is put has no effect upon the generation or distribution plant required, it would appear that there can be little objection to the offering of electricity for all purposes to all classes of consumers on a single comprehensive tariff, as indeed it is offered to domestic consumers under rate G, with obvious advantages for both consumer and supplier.

The basis of this tariff can be:—(*a*) a flat-rate; (*b*) a two-part tariff consisting of a fixed charge plus a kWh charge; (*c*) a demand tariff of so much per kW plus a kWh charge; (*d*) a demand tariff where the first block of units per kW are at a higher rate of charge than those in excess of that block; (*e*) a demand tariff where the demand is recorded over the "peak-load period" in addition to the individual maximum demand; and (*f*) a sliding scale or block tariff with any number of blocks. Of these the flat rate is obviously inadequate, while the complications of a tariff recording two demands would incur unduly high metering and invoicing costs except for large installations.

Of the remaining types, tariff (*c*) has the great advantage of covering, theoretically, the capital charges involved, independently of the kWh charges, immediately upon supply being taken. While tariff (*d*) does not, theoretically, cover the capital expenditure except where the consumption in kWh per kW is in excess of the limitations of the first block, it does encourage the consumer to increase his demand without the high charge involved under tariff (*c*).

The chief disadvantage of any tariff using a demand basis is the discouraging effect demand charges have upon the average consumer in respect of increasing the installed plant, since a slight increase in demand results in a relatively large increase of an account. Moreover, such a rate does not induce the consumer to increase the use of existing plant lest this too causes an increased demand charge. These effects are naturally most felt by the small consumer whose

accounts do not always exceed their standing charges by a great deal, and could with great benefit to the supply authority be increased by additional consumption. Where the ratio of consumption to demand is relatively low a flat rate will be adopted until the alternative demand rate becomes to the consumer's advantage financially. From this it follows that, in general, demand tariffs do not act as they are theoretically designed to do, but degenerate to a form of sliding scale with deterrents to increased consumption non-existent in the remaining forms of tariff.

Of the remaining forms, the block tariff does indeed become a two-part tariff with a fixed charge plus a kWh charge as each block limit of consumption has been exceeded, but the fixed charge component of each of the series of two-part tariffs depends on the consumption as also does the running charge. The advantage of a multiple-block tariff is, therefore, the encouraging effect that the decreasing kWh charges have upon increasing consumption.

Demand Effect

One theoretical disadvantage of the block tariff or two-part tariff, of which the standard type of domestic tariff is an example, is that the "demand effect" is not taken directly into account. This is particularly apparent in the domestic tariffs, the fixed charge of which may be based on the probable, but by no means actual, consumption and demand, assessed from the physical dimensions of the premises, number of rooms, number and size of lamps, and rateable value, none of which has regard to the value or incidence of the demand. Supplies under domestic tariffs can be taken for all purposes, *e.g.*, lighting, heating, cooking, water-heating, washing machines, washboilers, refrigerators, vacuum-cleaners, clocks, and so on. It follows, therefore, that houses of similar fixed charge may have connected loads varying from a few hundred watts to 20 or 30 kW covering all possible uses.

It would seem, however, possible to labour the "demand effect" unduly since the consumers on standard demand rates, *e.g.*, B1, B2, E1 and E2, are those with comparatively large consumptions per kW due to reasonably continuous use. While peak demands must necessarily be due to intermittent use, coinciding perhaps with the demands of the continuous user, the incidence of peak demands on systems has in recent years been during "cold spells," sometimes shortly after mid-day on a Sunday, when consumers on rates B1, B2, E1 and E2 are least likely to be using the supply as a class. As it is difficult to predict the probable time of day of a system's peak load, individual demands, unless measured at the time of the system peak, degenerate into an indication of the size of the service necessary to afford the supply required. Moreover, the recorded maximum demand is not necessarily its true value, being but an integration of the load or current over a limited period. In the case of thermal-demand indicators, the effect of even statutory voltage variations is not normally allowed for, so that the current on constant loads and also the recorded demands will vary, while with integrating instruments, owing to the recording periods being at definite intervals, the effect of peak currents at the beginning and end of the period are only partly recorded, although they may form the actual peak demand.

In addition to the capital charges for plant and the running costs, there are the charges due to accountancy and service to consumers, which must be borne by consumers as a whole. Since these expenses do not depend on individual demand or consumption, a block tariff is probably the most satisfactory rate for an inclusive supply, the larger portion of these charges being preferably covered in the first block of units. Such a block tariff might well be built up from the flat rates for lighting and heating and the minimum average kWh charge for power; the proposed rate might for example be 6d. per kWh for the first 100 kWh, 2d. for the next 900 and ¾d. for each kWh in excess of 1,000 per annum. For very large consumptions further blocks at ½d. or less might be made, with coal-price adjustments.

Such a rate need not affect the system of minimum charges on large installations due to the magnitude of the supply required, nor the contributions to the cost of affording such supplies. It follows that the rate might well be applied to temporary supplies, subject to other financial considerations being satisfactory. The proposed tariff would in no way preclude the use of limited-hour service rates for night or off-peak loads, nor would it affect special rates for unmetered supplies, save possibly to simplify their estimation.

Domestic Application

If offered as an alternative to the rates in the table, the proposed rate would probably attract the majority of consumers using scales A, B1, B2, E1 and E2, while those using rates C, D and E3 would be favourably affected by the inclusion of the complementary lighting insfallation. Thus a large proportion of consumers not on the domestic rate might be expected to adopt the simpler, more tractable and more comprehensible tariff. It is unlikely to be freely adopted by the majority of domestic consumers, because of the comparatively high charges. A modification of the proposed rate to a 1d. per kWh for a first block of units and then to ¾d. per kWh, would form an equivalent domestic rate, subject to a minimum of, say, £1 per quarter. This modified rate would temporarily impede the growth of domestic load until the

difference between average kWh charge and follow-on charge was appreciated. This would reduce temporarily the growth of the domestic maximum demand.

The adoption of the proposed rate would reduce the revenue from many consumers, including those with large lighting consumptions, but might encourage increased installations and longer use, with resultant increase in individual demand and the lengthening of its duration. At the same time, the removal of the demand bogey would encourage the small power user and increase the off-peak consumption. The proposed rate would result in economy to the undertaking due to the reduction in the number of meters, energising current, meter readings and connections, simplicity of accounting and a reduction in the number of queries and dissatisfaction due to the alternative rates available, which might be discontinued ultimately.

CORRESPONDENCE

Letters should bear the writers' names and addresses, not necessarily for publication. Responsibility cannot be accepted for correspondents' opinions.

Significance of "j"

PROFESSOR KAPP'S letter in your issue of June 19th is the first encouragement I have had in Britain for my ideas on "j." I trust that the good work will now go ahead.

The territory to be covered is immense and the "revor" or rotating vector of unit length will ultimately enter into mathematics for many purposes. Probably degrees and grades will disappear and the unit angle will be the rev (one rotation of the vector) divided into 1,000 millirevs which I hope will be called "jots," to distinguish them from the other terms beginning with "milli–." The change will be simplified by the fact that jots may be converted into degrees by multiplying by 0.36 so that tables are available.

I have been astonished by the fact that mathematicians did not immediately welcome the explanation of the plus or minus in the square root, that 1^n, where n is zero or even, has a positive square root and negative when n is an odd integer. Also the fact that when cones are placed on the three axes, $x0x$, $y0y$ and $z0z$, a sectioning plane cuts off not only the curves usually given but also the so-called imaginary curves. I expected the comment "Why that's obvious!" However, Professor Kapp has set the ball rolling and I trust that our mathematicians will soon be as willing to accept the ideas as mathematicians abroad appear to have been.

Tynemouth. C. TURNBULL.

Institution Membership

AS a corporate member of the I.E.E. of twenty years' standing, I can claim a term of service and experience as long as that of "Midlands" (*Electrical Review*, June 26, p. 823), but what proof can I proclaim to the world of my ability other than by an examination?

When I consult medical or legal opinion, I assume that such professional gentlemen have at some time been tried and tested by appropriate examining bodies. But in the electrical profession one finds crowds of persons just waiting for the "over forty" period when they can send in an application to the I.E.E. for corporate membership.

In advertising for an assistant I always insert in the advertisement that any I.E.E. diploma should be "by examination." How can anyone prove a stranger's merit from an application form? The fact that he has passed the I.E.E. or similar qualifying examination gives me greater assurance than corporate membership without examination.

My view is that, in fairness to existing members, the rules for admission to corporate membership should be tightened up, and not reduced to a mere farce by the relaxation "Midlands" suggests.

If, as "Midlands" states, he stands "to gain nothing from the Institution except the benefit of its valued discussions," certain classes of non-corporate membership will offer him all he requires with no need for an examination.

Eccles. EXAMINATION.

THE letter of "Midlands" in your issue for June 26th raises many interesting points which nearly forty years of engineering has taught me to view in a philosophical light.

To go back thirty years: we had two types of engineer, one on construction and operation and the other on research and teaching. The gap in the middle, as I saw it, was to be filled by the technologist who was a practical man with theoretical knowledge or a theoretical man with practical experience; anyway, he was an engineer, and in actual fact he really formed the backbone of the Institutions. The theoretical man, however, soon talked himself into the higher places and forthwith proceeded to beset the path to membership with pitfalls and mathematical obstacles calculated to discourage any really sound practical man from ever attempting

the feat. This wouldn't have been so bad if it had been in the interests of the profession, and the public, but it wasn't, and the backbone seems to be disappearing. This is a great pity, as sound professional institutions are necessary from the standpoint of both, especially the latter, that is why Royal Charters were granted.

Anyway, "Midlands" can take heart, because if anything is unsound or pernicious it brings discredit and breeds its own cure, as we see all around us to-day. The pity is that such cures are so drastic and often involve amputation, and so we now see all kinds of minor institutions springing up which should have been part of the main bodies and which can only lead to damage to such bodies and to utter confusion in the public mind instead of clarifying the position, the purpose for which the Institutions were at least partly intended.

We are now in a state of flux in more ways than one and much has to be changed in the old order, or the old order must disappear. The public is awakening and may do some silly things if faults are not remedied first, for after all they grant the charters.

Lancs. CHARLES BAXTER, M.I.Mech.E.

THE letter of "Midlands" should not pass unnoticed and I would like to congratulate him on his excellent letter; he does state a case which is parallel to that of many other men employed in the industry. There are many who would have become Members but for the hiatus of 1914-18 and this state continued for some considerable time afterwards.

One sympathises with the difficulty of the Institution as it has now a high standard to maintain, but it should be possible to find a *via media* in exceptional circumstances, and I hope consideration will be given to cases such as those which have been described by "Midlands."

*London, W.*14. W. C. HANDS.

Vacuum Cleaner Fatalities

IN your issue of June 19th you recorded two deaths brought about by faults on vacuum cleaners, which recalled vividly to my mind an instance that came under my notice about three years or so ago.

A woman was using a vacuum cleaner that had a metal handle containing the switch and in due course got just inside the scullery door with it when another woman in the house heard a loud scream, and she had the presence of mind to switch off immediately at the plug and release the injured woman, who was many months recovering from the effects of the shock.

I was called in to report on the case, but was never able to discover whether the user touched an electric cooker that was just inside the scullery or whether the shock was obtained through standing on the concrete floor or touching a wall.

An examination and investigation revealed that a few days before the accident the cleaner had been overhauled and apparently the flexible cord connections to the switch had been remade. Several loose strands of wire were outside the switch terminals and one or more of them were in contact with the metal frame of the handle. This, of course, made the handle alive, at 230 V AC, and caused the accident as soon as the user was "earthed." It was extremely fortunate that there was a second person present; otherwise the accident would probably have been fatal.

The point now arises after your reports of accidents: Is it safe to allow any vacuum cleaners to continue in use that have metal handles? Has the time arrived when they should all be condemned until they are refitted with handles of all-insulating material, and can this be done without causing too much of a scare among users?

If nothing of a very definite nature can be attempted during the war it is a matter that should have very serious attention immediately afterwards as it is unreasonable to allow death-traps to be used by the public indefinitely and without taking steps to prevent repetitions of these tragedies.

Bradford. HARRY MOSS.

Insulators Not "Munitions"

IT may be of considerable interest to electrical manufacturers generally to know that the Ministry of Labour under its latest ruling does not consider electrical porcelain insulators as "munitions of war." Switchgear, and other allied electrical products of which porcelain insulators form an essential, and sometimes the major part are, however, classed under this heading.

It is, of course, obvious that the manufacture of munitions could not get very far without the products of the electrical porcelain manufacturer, and we should be glad if you would be good enough to draw attention to this anomaly.

A. G. HACKNEY & CO., LTD.,
Hanley, Stoke-on-Trent. J. W. C. JONES, *Director.*

Staff Conditions at Bingley

REPLYING to the letter from Mr. R. J. Harley in your last issue, I would point out that it is not within my province, either as chairman of the Bingley Branch of N.A.L.G.O., or as chief electrical engineer to the Bingley U.D.C., to defend or explain the attitude of my Council towards the National Joint Board.

I, and my fellow officers, are members of N.A.L.G.O., and negotiations on our behalf have been conducted through that Association with the measure of success denoted in

my previous letter. Facts speak for themselves and need neither explanation nor elaboration.

The announcement which prompted my original letter might have led your readers to think that conditions generally at Bingley were unsatisfactory. I simply demonstrated that such is not the case, and at the same time indicated that there were no vacancies in the Electricity Department to which the "banning" notice could be related.

Bingley. OSWALD G. COOK,
Chairman, Bingley Branch, N.A.L.G.O.

Production and Export

THE article by Mr. Sills is so full of controversial matter and unproved statement that it is difficult to deal with. For example, one gathers from the concluding paragraphs that it is a moral obligation to buy goods from very large firms at high prices, though whether the high prices are due to inefficiency or to the alleged charitable activities of such firms is not stated, or why the obligation should exist.

It is a reasonable inference that Mr. Sills has not much experience of any but the largest firms or he would query the tendency to greater regimentation, the narrower experience, the submerging of personality and the passing-on of responsibility which are almost impossible to avoid with the staffs of huge organisations such as those proposed.

Actually the four large concerns to which he refers are considerably less in total personnel than the aggregate of the remaining firms, so that his expression "a small minority" has no meaning. If these four concerns were inflated by absorption of the small and medium ones they would tend to lose their initiative and have to be carried on by routine methods such as are unavoidable, for example, in large railway companies, the Army in peace-time, or Government Departments. Very shortly we should find them ruled by accountants and not by engineers, whose status would diminish. It is a fallacy to believe that ultra-large concerns are the most able or efficient.

On the other hand, should Mr. Sills be right, why does he stop at four organisations? Logically still greater advantages should accrue from having only one. Whether four or one, the biggest step towards nationalisation of the electrical manufacturing industry would have been taken, and we may yet see Mr. Sills in a neat uniform.

Finally, what is the difference, if any, between his ideas and the principles of Fascism?

Banstead. W. C. KENNETT, M.I.E.E.

THIS correspondence should live in the memories of your readers, not only on account of the importance of the subject, but because it has provided the entertaining conception of a bull charging a gate with its head buried in the sand—not an Irish bull, either.

Surrey. C.

PERSONAL and SOCIAL

News of Men and Women of the Industry

A NUMBER of appointments have been made by British Insulated Cables, Ltd. On the technical side, **Dr. J. L. Miller** has been appointed chief engineer, **Mr. N. K. Bunn** becomes works manager at Prescot, and **Mr. O. J. Crompton** is appointed manager of the Contract Department. On the sales side, **Mr. R. B. Paul** has been appointed general sales manager, **Mr. H. J. Stone,** home sales manager, and **Mr. H. R. Allen,** overseas sales manager.

Dr. J. L. Miller

Dr. Miller, whose portrait is reproduced, was chief research engineer to Ferranti, Ltd., before joining B.I. Cables last year as deputy chief engineer. He is a Ph.D. and D.Eng. of Liverpool University. He has published a number of papers as a result of his researches in various phases of high-voltage work.

Two employees of Bognor Gas & Electricity Co. have been honoured for brave conduct in civil defence. They are **Mr. W. R. Hammond,** assistant to the engineer and general manager, who is appointed M.B.E., and **Mr. H. Glazier,** general works maintenance employee, who is awarded the British Empire Medal.

The short list for the appointment of chief engineer and manager of the St. Helens Electricity Department has been reduced to two. They are **Mr. P. Bregazzi,** electrical engineer and manager, Ashton-under-Lyne, and **Mr. F. J. Cole,** electrical engineer and manager, West Bromwich.

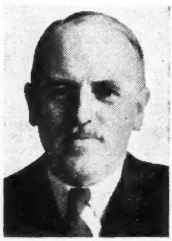
Mr. G. Henderson, A.M.I.E.E., has been elected president of the Association of Mining Electrical and Mechanical Engineers for the 1942–43 session. Mr. Henderson, who is a prominent member of the Lothians branch, served an apprenticeship with Bruce Peebles & Co., Ltd., and subsequently held appointments with Lancashire Dynamo & Crypto, Ltd., as a designer and with the Leith & Clyde Valley electricity supply undertakings as assistant engineer, returning to Bruce Peebles as chief technical manager and engineer-manager. In

June, 1940, he was appointed a Chief Labour Supply Officer with the Ministry of Labour and National Service, and early this year following the formation of the five Scottish District Man-Power Boards he became Labour Supply Officer, Edinburgh District.

Capt. R. T. Hinckes has resigned from the board of the Electric Supply Corporation, Ltd., after over thirty-five years' service with the company, and **Mr. J. N. A. Houblon,** M.I.E.E. has been elected to fill the vacancy. **Mr. J. Eustace,** A.M.I.E.E., chief engineer to the Corporation, has been elected an additional director, and **Mr. M. Harker** now becomes general manager and secretary.

Mr. E. Mathews, meter superintendent in the Hackney Borough Council Electricity Department, has retired after forty-three years' service with the undertaking. Presentations of a canteen of cutlery and a model of the *Bounty* were made to him on June 30th.

As we report in our "Commerce & Industry" section, two of the eleven new Regional Controllers of Production are **Mr. L. E. Mather,**



Messrs. L. E. Mather and C. B. Colston

chairman of Mather & Platt, Ltd., and **Mr. C. B. Colston,** chairman and joint managing director of Hoover, Ltd. Their portraits are reproduced herewith.

Mr. W. D. Reid, engineer for Scotland of Callender's Cable & Construction Co., Ltd., retired at the end of last month after fifty-four years' service with the company. Mr. Reid had been responsible for many of that company's very early underground cable-laying contracts and was actively engaged in contract work at the time of his retirement. In 1938, to celebrate his fifty years with Callender's, he was present at a special luncheon as the guest of the directors and received a presentation to celebrate the occasion. Even now, Mr. Reid has not severed his connection with the electrical world, as he remains the C.M.A. War Emergency Liaison Officer for Scotland and also retains his directorship of the Skelmorlie Electricity Co., Ltd. **Mr. A. C. Kington** has taken over the duties and

Mr. W. D. Reid

management of Callender's contracts office for Edinburgh and district.

Mr. F. D. Larcombe, Callender's district engineer in Manchester, retired at the end of last month. He had been in the company's service for twenty-three years. The Manchester contracts office is now under the management of **Mr. G. A. Rendle.**

Mr. J. G. Shaw, who has been a director of Lancashire Dynamo & Crypto, Ltd., for many years, has been appointed vice-chairman of the company. Mr. Shaw was one of the founders of the Crypto Electrical Co., Ltd., and after the merging of the two companies was a joint managing director of L. D. & C., Ltd. until 1936.

Mr. J. G. Shaw

The recent death of Mr. H. C. Sanders, one of the founder directors of Santon, Ltd., left another vacancy on the board, and the two vacancies have now been filled by the election of **Mr. K. J. Fulton** and **Mr. J. C. Sanders,** A.M.I.E.E. (both sons of founder directors) to fill the vacancies. Mr. Fulton has been manager of the London office of the company for a number of years. Mr. Sanders received his technical training in both mechanical and electrical engineering with the B.T.H., Rugby, and has been works manager of Santon, Ltd., for several years.

Mr. W. J. H. Wood, M.I.E.E., M.I.Mech.E., engineer-in-chief of the County of London Electric Supply Company, Ltd., and of its associated companies, has been appointed a director of the Kent Electric Power Co. In addition to his activities as engineer-in-chief of the County Group of electricity supply companies, Mr. Wood is connected with several electrical associations and bodies. He is a member of the C.E.B. National Consultative Committee, chairman of the C.E.B. South East and East England District Consultative Technical Committee, and a member of the Council of the Power Companies' Association.

Obituary

Mr. A. J. McColgan.—We report with great regret the death, on July 5th, of Mr. Albert John McColgan, M.I.E.E., A.M.Inst.C.E., H.M. Deputy Senior Electrical Inspector of Factories. Mr. McColgan commenced his career in the Leeds City Tramway Department and in 1910 joined the Yorkshire Electric Power Co. as a constructional engineer. From 1912 to 1921 he was with the Newcastle-upon-Tyne Electric Supply Co. and during the last war he served with the Royal Engineers.

He was appointed an Electrical Inspector of Factories in 1921, and became Deputy Senior Electrical Inspector in 1934.

Mr. John H. Watkins, electrical and mechanical engineer, who for forty years was superintendent engineer with Sir Henry Royce, at Trafford Park, died last week at Altrincham, aged eighty-one.

COMMERCE and INDUSTRY

Regional Industrial Control. Lighting and Economy.

Control of Production

IT was announced by Mr. Lyttelton, the Minister of Production, in the House of Commons last week that eleven Regional Controllers of Production had now been appointed and that the work of the Regional Control Boards had commenced. The task of the Controllers and their Boards is the planning of all resources in their regions to secure greater productivity. District committees are also to be set up and so far thirty-six have been established.

The eleven Regional Controllers are as follows:—London and South-Eastern: Mr. C. B. Colston, chairman and joint managing director of Hoover, Ltd. Southern: Mr. J. W. Howlett, chairman and managing director, Wellworthy Piston Rings, Ltd. South-Western: Mr. H. I. C. Rogers, joint managing director Brecknell, Munro & Rogers (1928), Ltd., a director of the Bristol Gas Co. and formerly South-Western Regional Controller, Ministry of Supply. Wales: Mr. P. Thomas, formerly Welsh Regional Controller, Ministry of Supply. Midlands: Col. H. E. Sankey, managing director of Joseph Sankey & Sons and a director of Guest, Keen & Nettlefolds, Ltd., John Lysaght, and Harrison Sheldon. North-Western: Mr. L. E. Mather, chairman and managing director Mather & Platt, Ltd. Scotland: Mr. L. J. B. Forbes, managing director of Triplex (Northern), Ltd. Northern: Viscount Ridley, a director of the Consett Iron Co., L. & N.E. Railway Co. and other companies and adviser to the Air Ministry on Hydrogen Production. East and West Riding: Mr. C. H. Crabtree, chairman and managing director of R. W. Crabtree & Sons, Ltd. North Midland: Mr. H. H. Berresford, managing director, Staveley Coal & Iron Co. Eastern: Mr. H. Weston Howard, managing director Heyward Tyler & Co.

Preparations for Rationing

The Electricity Commissioners have requested authorised electricity undertakings to furnish to their Local Fuel Overseers particulars of the actual consumption of electricity by the occupier of every controlled premises in their areas for each of the last four quarters to the date of the last meter reading.

To assist the Ministry of Fuel and Power in its economy campaign undertakings are asked to report to the Commissioners any cases which come to their notice of flagrantly extravagant use of electricity in commercial or industrial premises.

Fuel Economy

The July *Chamber of Commerce Journal* reports that following the receipt of a communication from the Industries and Manufactures Department of the Board of Trade a memorandum prepared by the chairman of the Council of the London Chamber of Commerce was forwarded to the Board. This memorandum emphasised that lighting, whether for public or private premises, comprised but a small proportion of the output of power stations and that a cut of 20 per cent. in lighting would result only in a very meagre saving. Greater scope for economy lay in the use of electricity for power purposes, and the chairman suggested a way in which consumers making excessive use of electricity could be checked and, if necessary, penalised.

In forwarding this memorandum, the Chamber advocated leaving it to the occupier to effect economies in such ways as he found best, subject to the proviso that if he did not bring his consumption within a scale which his supplier would have set for the size of the building and nature of use, he would be called upon to justify his consumption. It also strongly deprecated inadequate lighting, whether in factories or offices, for work actually in progress as any small saving in light would be far more than offset by loss of efficiency through an increase in accidents and sickness. Also a proportionate reduction of existing lighting would, in the opinion of the Chamber, be most inequitable, imposing as it would a penalty on the most efficient concerns which had already eliminated waste, whilst imposing no such hardship on the inefficient. The standard should be that of the efficient, to which the inefficient should now be made to conform.

Domestic Consumers in Wartime

Useful information for enabling the householder to make the most of his electrical installation, having regard to the present need for economy in the use of electricity and to the difficulty of obtaining new apparatus, is presented in a thirty-page brochure, "Helpful War Time Hints," sent us by Mr. Davis De Bard, vice-president of the Stone and Webster Corporation, which controls a number of supply undertakings in the United States.

Among the subjects dealt with are reading meters, renewing fuses, elements of good lighting and the efficient use and maintenance of appliances. Refrigeration is shown not only to prevent wastage of food, but also, which is of even greater importance, to conserve vitamins, which are more easily and quickly destroyed by air and heat than are the foodstuffs themselves.

Power Engineers' Salaries

There will be no cost-of-living adjustment in the scale of salaries for members of electricity supply undertakings' staffs from July 1st. Consequently the figures remain as printed in the *Electrical Review* of July 18th, 1941.

The effect of the recent Industrial Court award has been shown by inserting "shift charge engineer" against Grades 7 (Class J and above) and 8 (Classes A to H) with appropriate demarcations.

Ministry of Works and Planning

The new Ministry of Works and Planning has now been formally established and Lord Portal, hitherto Minister of Works and Buildings,

changes his designation. He will continue to hold office as First Commissioner of Works and Public Buildings. Messrs. G. Hicks and H. G. Strauss are Joint Parliamentary Secretaries to the Ministry. The powers and duties of the Minister of Health under the Town and Country Planning Act, 1932, are being taken over by the Ministry.

Consolidated Export Control Order

The Board of Trade has issued the Export of Goods (Control) (No. 28) Order, 1942 (S.R. & O. 1942 No. 1251), the chief effect of which is to consolidate previous Export Control Orders. The new Order comes into force on July 15th and sets out the position with reference to Export Licensing Control at that date. Changes have been made in the list of "All goods" destinations and in the provision under which certain goods may be exported through British Indian ports for transit overland to destinations in China. Copies of the Order (price 8d.) are available from the Stationery Office or through booksellers.

Tungsten-bearing Scrap

The Ministry of Supply has issued the Control of Iron and Steel (No. 24) (Scrap) Order, 1942, which came into force on July 4th. The Order provides that every person having in his possession in any premises, scrap steel containing tungsten shall segregate such scrap in one place in those premises. The Order does not affect the the right of an owner of scrap steel containing tungsten from disposing of it in the ordinary course of business to a merchant licensed to buy it. In addition, the Order further varies the Control of Iron and Steel (No. 14) (Scrap), Order 1940, by fixing the maximum price for high-speed steel solid scrap containing 5 to 6½ per cent. tungsten and 5 to 6½ per cent. molybdenum at 9d. per lb. and for high-speed steel turnings of a similar specification at 5d. per lb.

Circuit-Breaker Maintenance

With a view to assisting those responsible for lower-voltage industrial switchgear (even if they have but slight electrical knowledge), J. G. Statter & Co., Ltd., have issued a four-page pamphlet (Ref. OCB/1) relating to the maintenance of oil-immersed circuit-breakers. The need for periodic inspection is first emphasised, after which follow notes on installation. Oil receives its share of attention and practical hints are given on the care of contacts and of the mechanism generally. Other items dealt with in brief and simple form include automatic releases and instruments.

Magnetic Crane Locomotive

There has recently been completed for service in a large steelworks a steam locomotive of the conventional shunting type that is additionally fitted with a jib crane which incorporates an electro-magnet for lifting metal. The engine was built by Andrew Barclay, Sons & Co., Ltd., Kilmarnock, with its frame supporting the crane pedestal, spanning the barrel of the boiler. The capacity of the hook is 5 tons, while the maximum load of the magnet is 4 tons 2 cwt., the difference of 18 cwt. being the weight of the magnet and its accessories, which were supplied by the Witton-Kramer Electric Tool and Hoist Works, Birmingham. The magnet is energised by a steam turbo-generator made by Greenwood & Batley, Ltd., Leeds, the set being mounted on top of one of the locomotive's side tanks containing feed water. Because of the set's high speed, its bearings have forced lubrication, the oil being cooled by passing through a coil immersed in the feed tank. The electrical control gear is in the driver's cab, close to the crane and engine controls. The jib must be capable of full-circle slewing, and *Engineering* explains how the single-core cables for energising the lifting magnet are wound on a spring drum attached to the jib and then pass down conduit inside the hollow hoisting shaft, which is coaxial with the jib post, terminating in a pair of slip rings rotating against brushes connected by cables to the generator.

American Cooker Production Restricted

After the end of May the production of electric cookers, except those for military uses, ceased in the United States. Moreover, all cookers in stock at that date were to be held for supply on priority orders only. The May quota of iron and steel for manufacturers was one-twelfth of that used in the year ended June 30th, 1941, but they were allowed to use up any remainders from their January-April quotas. There is no restriction upon the manufacture of replacement parts for existing cookers.

No Waste

Statements regarding the shipping position do not indicate any improvement and, combined with our losses of raw material resources, this makes it obvious to everyone that the utmost must be made of our stocks and limited incoming supplies. Rubber, metals and paper are leading vital materials and not only must the best and most economical use be made of them but every bit of "waste" must be recovered. Nowadays there is no such thing as waste material ; practically everything can be salvaged for further use. Those firms who have not already done so should appoint a salvage officer from the staff and give him sufficient authority to enable him to recover everything that has further value.

Re-forming Worn Surfaces

Considerable economy results from the reclamation of machinery by the deposition of layers of hard metal on worn surfaces as well as the reconditioning of cutting tools by retipping them. The value of the electric arc process for such purposes is well illustrated in a leaflet (M 16a/GD) recently published by Murex Welding Processes, Ltd., Waltham Cross, Herts, which not only instances typically varied examples but also gives details of the degrees of hardness to be expected of deposits from different electrodes, classified according to the kind of work for which they are most suitable. Types range from lightly alloyed varieties for reinforcing steels of medium carbon content and railway track rails to austenite alloy for building up lips of dredger buckets and manganese rail crossings ; also electrodes for depositing weld metal of about 600 Brinell hardness, one of the latter class being particularly suitable for forming cutting edges not subjected to high temperatures, such as those of woodworking tools and

shearing blades, or dies, while another deposits metal similar to high speed steel for tipping mild steel shanks to form lathe tools.

Wages in the Contracting Industry

As from the second pay-day in July (for the period covered by that pay-day) the weekly cost of living addition to the wages of men employed in the electrical contracting industry will be 18s. 4d. up to and including the first pay-day in October next. This represents a deduction of 5d. from the current rate.

"Distribution of Electricity"

The latest journal to join the ranks of those who have had to "reduce" on account of the paper shortage is Henley's "Distribution of Electricity." Already it had become a quarterly instead of a monthly. In its new form "Distribution" is very attractive and, if anything, we like it better than before. The contents remain at the usual high standard and the amount of matter does not appear to have been appreciably reduced.

Control of Lac

The Minister of Supply has issued the Control of Lac (No. 1) Order, 1942, under which the use or consumption of any lac for the purpose of making sound records is made subject to licence. The Order takes effect from July 14th, and applications for licences to use or to consume lac for that purpose on or after that date whether from existing stock or not, should be addressed to the Ministry of Supply, Raw Materials Department (Lac Control), The Castle, Warwick. Copies of the Order (price 1d.) may be obtained from the Stationery Office.

Visit to Scottish Cable Works

About seventy of the Clyde Valley Electrical Power Co.'s jointers and their mates were entertained last week at the factory of the Scottish Cables, Ltd., where they were given the opportunity of seeing modern methods of cable manufacturing. The visit was arranged in accordance with the power company's policy of encouraging its employees to extend their electrical knowledge, and the large attendance testifies to the way these facilities are appreciated. The visitors were welcomed by Mr. W. Fraser, chairman and managing director of the cable company. Thanks to Mr. Fraser and his staff for their hospitality were expressed by Mr. J. Paterson, director and general manager of the power company.

American Dry Batteries

Publication of the fourth edition of the American Standard Specification for dry-cell batteries (C18–1941–C435 of the National Bureau of Standards) represents a step in development that originated in purely governmental needs in the last war period.

Since then co-operation between makers and users has revealed both the ability and willingness of manufacturers to improve their products to such an extent that the output obtainable from the better brands of older types of batteries is now four-fold greater than it was some twenty years ago. For example, the useful life of one size of hearing-aid batteries has been raised from 18 to 50 hours' service; that of radio B-batteries from 377 to 1,500 hours, that of flashlight cells from 260 to 750 minutes (intermittent) and of the larger industrial type from 250 to 975 minutes; that of telephone type cells from 155 to 450 days (intermittent); while the spontaneous shelf deterioration (six months) of dry cells of the ordinary general-purpose type has been reduced from 35 to 7 per cent.

B.S. for Raw Copper

Since 1924, when a series of specifications for raw copper was issued bearing the reference numbers 198–203, it has been found that the classification for the copper then adopted did not fit in with the requirements of industry. Accordingly, in the new B.S. No. 1035 a new series based on the classification at present adopted in industry has been developed providing for cathode copper, high conductivity copper produced electrically and by a fire refined process, and for three grades of tough pitch copper in which conductivity is not specified. The specifications include requirements relating to surface defects, dimensions and tolerances on dimensions and marking. The procedure to be adopted in dealing with disputes is also outlined. A note states that a complementary document dealing with methods of sampling and of chemical analysis for the determination of impurities is also in preparation and should be available shortly. It is proposed that as and when the various British Standards for copper products are revised, reference will be included to the appropriate specification for raw copper. Copies of this specification may be obtained from the British Standards Institution, 28, Victoria Street, S.W.1, price 2s. 3d. post free.

Effect of Miners' Wage Increase

Replying to a question about the effect of the increased cost of coal, consequent on the miners' wage increase award, Sir Kingsley Wood, the Chancellor of the Exchequer, intimated that the domestic consumer would have to bear the increase, which would be equivalent to the rise of about one point in the cost of living index figure. He was consulting representatives of industry about the effect of the increase on industrial coal, and these consultations would also include representatives of gas and electricity concerns.

Electrical Equipment on Tyneside

The Tyne Improvement Commissioners are providing electric trucks, gravity roller equipment and a Diesel-electric mobile crane for loading on the riverside.

Trade Announcements

The business carried on by Mr. Samuel Baxter for the past twenty years in the manufacture and repair of electric motors has now been incorporated in the Rainville Engineering Co., Ltd. Mr. Baxter's services have been retained as chief electrical engineer.

British Ropes, Ltd., have appointed Mr. Frank H. Randall (who has been for many years with Richard Johnson & Nephew, Ltd.), as London manager, wire sales.

I.E.E. Regulations

Wartime Relaxations

IN order to economise in materials, the I.E.E. Regulations for the Electrical Equipment of Buildings (eleventh edition) that relate to voltage-drop and current ratings of cables, are to be relaxed until the conclusion of the war.

In circuits other than motor circuits, Regulation 304 still holds good except where

TABLE 5 (A)

Cross-Section Sq. in. 1	Current rating Amperes 2	Length in feet (lead plus return) for 1-volt drop 3
0.0015	10	30
0.002	15	26
0.003	20	25
0.0045	30	24

the voltage of the consumer's installation is maintained approximately constant irrespective of variations of the supply voltage. In that event the voltage at the terminals of any appliance may be not less than 95 per cent. of the declared supply voltage. The normal voltage at the terminals of motors shall be not less than 92.5 per cent. of the declared voltage. The foregoing provisions do not apply to earthed concentric wiring, for which the present Regulation 305 still holds good.

Modified current ratings will be subject to compliance with the revised requirements for voltage drop, which should be limited in order to ensure that the saving in copper is not offset by the increased watt loss in the cables.

Where advantage is taken of the increased current ratings allowed in the revised Table 5, the appropriate sizes of fittings must be used. The current ratings of the cables set out in Tables 6 to 9 have been increased by 20 per cent. A flexible cord having a current rating of 5 or 10 A. may be connected to a circuit protected by a 15-A fuse, but the current ratings are not increased.

A new Table, 5 (A) gives current ratings for small single-core cables of earthed concentric wiring (the base metallic sheath being used as the return), provided the circuit length (lead and return), do not exceed the values which are set out in Column 3 of the table.

Mineral-Insulated Cables

The current ratings of mineral-insulated copper-sheathed cables smaller than 0.007 sq. in. may be increased in accordance with the figures in Table 5. For the larger sizes, whether bunched or spaces, they are as shown in a new Table 10 (A), which for these sizes of cable takes the place of Tables 10 to 12 which are referred to in Clause 302 (B) of the Regulations.

TABLE 5
(modifications only shown)

Conductor		Maximum Four Single-Core Cables		Maximum Eight Single-Core Cables	
Cross-section Sq. in. 1	No. and diameter of wires 2	Current rating Amperes 3	Length in feet for 1-volt drop 4	Current rating Amperes 5	Length in feet for 1-volt drop 6
0.002	3/.029	10	23	8	29
0.003	3/.036	15	23	10	33
0.0045	7/.029	20	25	15	33

TABLE 10 (A)
Mineral Insulated Cables of 0.007 sq. in. Cross-sectional Area and Above

Cross-section	Single-core Cables		Twin Cables		Three or Four-core Cables	
	Current rating	Length in feet (lead plus return) for 1-volt drop for AC	Current rating	Length in feet (lead only) for 1-volt drop for AC	Current rating	Length in feet (lead only) for 1-volt drop for balanced three-phase AC
Sq. in. 1	Amperes 2	3	Amperes 4	5	Amperes 6	7
0.007	55	14	45	8	35	22
0.01	70	16	55	10	45	24
0.0145	90	18	70	11	55	28
0.0225	110	22	85	14	70	35
0.03	130	25	100	16	85	38
0.04	150	29	—	—	—	—
0.06	200	31	—	—	—	—
0.1	260	39	—	—	—	—
0.15	330	44	—	—	—	—
0.2	400	44	—	—	—	—

The current ratings of bare solid copper conductors which are shown in Table 16 of the Eleventh Edition have been increased by 20 per cent. except where painted black (*i.e.*, the first sentence of the note appended to Table 16 is cancelled).

Industrial Wages

AN illuminating survey of the course of wages during the war appears in the June *Ministry of Labour Gazette*. It is based on particulars supplied by about 56,700 establishments in all branches of industry employing over six million people. To eliminate the effects of disparities between the numbers dealt with in each of the sixteen groups which are covered the general averages have been recalculated on the basis of the estimated number of workers employed in the individual industries. In each case the average earnings shown include those of all classes of manual wage-earners without deduction of income tax, insurance, etc.

A table shows that the average weekly earnings of men over 21 years of age in all the classes covered rose from 69s. 0d. in October, 1938, to 102s. 0d. in January, 1942 (47.8 per cent.) and those of all workers from 53s. 3d. to 77s. 9d. (46.0 per cent.). In the metal, engineering and shipbuilding industries the amount increased from 75s. 0d. to 119s. 2d. (58.9 per cent.) for men and from 59s. 8d. to 93s. 0d. (55.9 per cent.) for all workers. The increases in public utility services were as follows :—Men, from 63s. 1d. to 79s. 9d. (26.4 per cent.) ; all workers, from 59s. 8d. to 73s. 4d. (22.9 per cent.).

It has to borne in mind that, apart from increases in actual wage rates, the figures are affected by fuller employment, with longer working hours and more extended working of night shifts ; extension of payment by results ; and changes in the proportion of men, women, boys and girls employed in the various industries. The *Gazette* calculates that the actual increase in general wage rates between October, 1938, and January, 1942, was about 22 per cent.

Electrical Groups

An analysis of the metal, engineering and shipbuilding group reveals that in the electrical engineering industry the average weekly earnings of men over 21 years of age in January, 1942, was 115s. 11d., an increase of 55.8 per cent. as compared with the October, 1938, rate. For youths and boys the figure was 40s. 9d. (64.6 per cent. increase) ; for women of 18 or over 51s. 2d. (57.8 per cent.) ; girls, 27s. 10d. (44.0 per cent.) ; and all workers, 76s. 11d. (51.3 per cent.).

In the " electric cables, apparatus, lamps, etc. " group average weekly earnings in January 1942, were 111s.2d for men (52.3 per cent.increase since October, 1938) ; 45s. 10d. for youths and boys (49.5 per cent.) ; 48s. 8d. for women (36.4 per cent.) ; 27s. 9d. for girls (33.2 per cent.) ; and 73s. 10d. for all workers (47.4 per cent.).

For men employed in the electrical contracting industry weekly earnings are given as 107s. 10d., a rise of 36.2 per cent. as compared with October, 1938. The figure for youths and boys is 37s. 5d. (77.5 per cent. increase) and that for all workers, 84s. 2d. (48.3 per cent.).

Weekly earnings of men engaged in the electricity supply industry were 91s. 10d., an increase of 26.8 per cent. over the October, 1938, amount ; those of youths and boys, 31s. 3d. (19.0 per cent. increase) ; women earned 49s. 8d. a week (96.1 per cent.) ; and the average rate for all workers was 85s. 5d. (24.2 per cent. increase).

Wimbledon Pension

ON June 30th at an adjourned meeting the Wimbledon Town Council agreed to fix the pension of Mr. A. E. McKenzie, the chief electrical engineer at £2,426 per annum. Prior to his retirement Mr. McKenzie is to give another year's service at a salary of £3,832 less the amount of superannuation allowance.

There was strong opposition from Labour councillors and others to the Finance Committee's proposal and some disturbance in the public gallery. An inspector of police said that he had no power to clear the gallery, so the Mayor directed that the meeting should be continued in a committee room.

During the discussion Councillor Lewis tabled an amendment that the pension to which Mr. McKenzie was entitled under the Superannuation Act (£1,660) should be paid and not the one recommended by the Committee. He said that with one exception Mr. McKenzie had been the highest paid local official in the country. Councillor Wyles reminded the Council that they were spending public money and asked them to reject the proposal. Mr. McKenzie, he said, went to Wimbledon in 1920 at a salary of £1,000 and for the last five years his salary had been £3,830, a very big increase. He had also been allowed to carry on a private practice.

The One-sixtieth Basis

Councillor Kelly expressed the opinion that the chairman of the Finance Committee should have given the Council fuller particulars. They had been told that Mr. McKenzie's pension was only comparable to that of previously retiring officials whose pensions had been based on 1/60 of their salaries for each year of service, but the late Town Clerk had not received a pension on that basis. Mr. McKenzie, had he desired, could have made the non-contributory period of his pension contributory. If there was a deficiency in the superannuation fund there was no other fund on which they could draw.

Councillor T. Braddock said there had never been an official retiring from the Council's service who had received a pension of £2,000. Alderman Dudley Stuart said it had been the custom of the Council to give an official a pension of 1/60 of his salary for each year of service provided he had given good and long service. So far as he had ascertained, the Council had always done that and the occasion mentioned by a previous speaker was not comparable with the present one. Councillor Lewis had complained that he had not had sufficient information, but all the information necessary was in the minutes of the Council.

The Labour amendments were defeated and Alderman J. W. Hickmott (chairman of the Electricity Committee) said that Mr. McKenzie wanted it to be understood that he would be glad to leave at the first opportunity after they had appointed a new man. If they had appointed a new man now they would have had to pay £1,800 a year and would probably have lost the £3,000 a year paid by the London J.E.A. so long as Mr. McKenzie was in the Corporation's service. Therefore they would be £1,600 in pocket next year. The proposal to pay Mr. McKenzie a salary of £3,832 next year less the superannuation allowance of £2,426 was then agreed to.

ELECTRICITY SUPPLY

Concessions at Huddersfield.

Huddersfield.—THREE-PHASE AGREEMENTS.—The Town Council has agreed that where a factory has been compulsorily closed down or its operation drastically reduced as the result of the concentration of industry policy, the Corporation will not demand the guaranteed minimum payment required under a three-phase agreement for the time being, but the electricity consumed on the premises will be charged at a flat rate of 1½d. per kWh. In premises where the total lighting consumption exceeds the power consumption no reduction will be made in the charge of 4d. per kWh, unless the reduction in the power consumption is the result of the concentration of industry policy or because the business carried on in the premises has been closed down owing to the war.

London.—STOKE NEWINGTON.—The Electricity Committee reports that applications have been received for the provision of electric cooking in wardens' posts. The Committee has agreed that the special scale (with prepayment meter) of 1½d. per kWh already approved for similar supplies for cooking in public shelters shall be applied to wardens' posts.

Southampton.—GRIT EMISSION.—Steps have recently been taken to obtain an improvement in coal supplies in order to secure an abatement of the grit emission at the power station. A deputation to the Mines Department recently urged that the quality of the coal should be improved and that better arrangements should be made to segregate the various classes of coal so that they could be identified on arrival and used accordingly. Mr. W. G. Turner, the borough electrical engineer, reported to the Emergency Committee on an interview he had had with the shippers' inland manager, who had now received instructions from the Mines Department as to the composition and loading of future cargoes of coal, compliance with which, it was hoped, would result in a more careful separation of the high-and low-volatile coals and the better blending of the now many varieties comprising each of these classes. Alderman Woolley, chairman of the Emergency Committee, told the Council that it was hoped that the measures mentioned would bring relief of a noticeable and substantial kind in regard to the grit nuisance.

Southampton Coal Supplies.

United States.—POWER RATIONING MACHINERY.—An Order issued by the War Production Board outlines machinery for wartime rationing of electric power anywhere in the country. According to the *Electrical World*, parts of the Order are likely to be invoked in three or four areas within the next month or two. The Order provides for maximum integrated operation and the conservation of energy or capacity. Utilities are directed to obtain information of all non-utility generating facilities exceeding 100 kW in their areas. Once a " shortage area " is set up a number of provisions may be put into operation including prohibition of non-essential daytime lighting, institution of consumption quotas (energy or demand) for all specified essential consumers, maximum interchange of energy between utility and non-utility plants and prohibition of plant shutdowns for overhaul.

VALUE OF INTERCONNECTION.—At the annual meeting of the North-West Electric Light and Power Association it was revealed that interconnection of six large power systems in five Pacific North-West States had released energy equivalent to between 50,000 and 100,000 kW of new capacity. Operation of the co-ordination plan is made effective by weekly telephone conferences between members of the committee representing the six companies.

ST. LAWRENCE SEAWAY PROJECT.—In the closing sessions of the New York Senate a resolution of the New York State Assembly condemning the proposed St. Lawrence seaway development was rejected.

Overseas

Argentina.—INCREASED POWER OUTPUT IN 1941.—The Association of Electric Power Producers and Distributors of the Argentine has issued a return showing the aggregate sales of electric power in the Republic for the whole of the past year. It shows a total of 2,024.6 million kWh for the twelve months as compared with 1,940 million kWh in 1940 an increase of 4.3 per cent. It is added that the Association's figures represent approximately 95 per cent. of the country's total sales. It is doubtful if the figures for the current year will equal those of 1941, for owing to the difficulty of obtaining sufficient supplies of fuel the principal electricity undertakings have found it necessary to issue a notice to their customers to exercise the greatest economy in the use of electricity for lighting, heating and power purposes.

TRANSPORT

Newcastle-on-Tyne.—RUNAWAY TROLLEY-BUS.—The courage and coolness of a trolley-bus driver and his conductress when their vehicle containing 74 passengers ran away down Westgate Hill, Newcastle-on-Tyne, has been recognised by the City Transport and Electricity Committee. The driver, Mr. R. Walton, who has had 31 years' service with the undertaking, has been awarded £10 and the conductress, Mrs. M. Gold, has received £5. Another conductor, Mr. G. Shipley, who was on the bus at the time though not on duty, helped to calm the passengers and was also awarded £5. The trolley-bus, after running down Westgate Hill, was brought to rest by the driver, who managed to turn it into a side street.

South Shields.—TROLLEY-BUS EXTENSION.—An extension of the Corporation's trolley-bus service connecting Laygate with Slade Terrace has been opened. The route was inspected by Mr. H. J. Troughton, transport manager, acting as the appointed representative of the Ministry of War Transport.

Wolverhampton. — BROADCAST BY WOMAN TROLLEY-BUS DRIVER.—Miss Amy Davies, a former conductress on the Corporation trolley-buses, who has passed her driving tests, broadcast her experiences in learning to drive in a B.B.C. news bulletin recently.

FINANCIAL SECTION

Company News. Stock Exchange Activities.

Reports and Dividends

Callender's Cable & Construction Co., Ltd., held its annual meeting on July 3rd, when Sir J. Fortescue Flannery, Bt. (chairman), who presided, said that the expenses for the year under review were less than in 1940, in spite of the fact that the cost of repairs and maintenance of plant and buildings had increased by £2,000 and contributions to pension funds and superannuation allowances by £1,300. In addition to the allowances which were made to their men serving in the forces, the company paid not only its own contribution to the Pension Fund in the case of the staff, but the individual's contribution also. For non-staff employees it had set up a fund for the purchase of National War Savings Certificates for their benefit when the war was over. The company had established a National War Savings Association which had 1,100 contributors. There had been a great change-over in the workpeople, a large number of women being introduced into the factory and offices.

They were substantial holders in the Okonite-Callender Cable Co., Inc., of Patterson, New Jersey, U.S.A. Under the Finance Powers (U.S.A.) Securities Act, 1941, and in accordance with the terms of the agreement between the United Kingdom Government and the Reconstruction Finance Corporation of U.S.A. these securities had been deposited by the Bank of England with the Reconstruction Finance Corporation as part of the security for the loan made by the United States Government to the United Kingdom Government.

Sir Fortescue referred to the retirement of a number of the members of the senior staff and mentioned that Mr. G. Bernard, their engineer for the Birmingham and Midland district, who had retired after 61 years' service with the company, was continuing as an advisory director.

J. Stone & Co., Ltd., report a trading profit of £474,151 for 1941, an increase of £78,099 as compared with 1940. After providing for depreciation, buildings replacement and repairs, directors' fees, etc., there is a net profit of £214,109 (against £208,521). The dividend on the ordinary shares is maintained at 25 per cent., and the balance carried forward is £276,415 (against £251,406 brought in).

The Kalgoorlie Electric Power & Lighting Corporation, Ltd., reports a net profit for 1941 of £30,691, as compared with £38,469 for 1940. After providing for United Kingdom tax (£7,336) and depreciation reserve (£16,000) it is proposed to pay a final dividend of 2 per cent. (against 4½ per cent.), making 5 per cent. (against 7½ per cent.) for the year, and to carry forward £9,143 (against £11,163 brought in).

The Madras Electric Tramways (1904), Ltd., reports a net profit for 1941 of £9,012 as compared with a loss of £2,134 for the previous year, to which is added £6,203 brought in, making £15,215, which is carried forward.

In his statement issued with the report, Mr. K. A. Scott-Moncrieff (chairman), said that the directors had confidently hoped that a full year's dividend would have been paid on the preference shares, which had been in arrear since March, 1939. With the outbreak of war with Japan, however, the position in the Far East rapidly deteriorated, and although they did not experience any labour troubles, there were strikes in Madras during March which led to some of the mills being temporarily closed. There had also been evacuations from Madras and consequently, although up to the end of March their aggregate traffic receipts were still above those of the corresponding three months of 1941, in April and May there were serious fallings off. Should traffic not show a considerable improvement in the near future it would probably be necessary to raise funds to cover working expenses.

The Telephone Manufacturing Co., Ltd., announces a profit of £173,902 for 1941, against £70,763 in the previous year. Taxation absorbs £134,687 (against £41,780), £20,067 is put to general reserve (£13,228) and a final dividend of 6½ per cent. is paid, again making 9 per cent. for the year.

The Palestine Electric Corporation, Ltd., reports a net profit for 1941 (after providing £110,000 for tax) of £100,824, as compared with £62,134 in the previous year. Dividend payments are resumed on the ordinary and "A" ordinary shares by the distribution of 4 per cent., tax free. The previous payment on the ordinary capital was 5 per cent. in respect of 1938.

The Singapore Traction Co., Ltd., which recently invited tenders of its 5 per cent. convertible first mortgage debenture stock from its debenture stockholders, has accepted tenders at £85 per cent. and under in respect of stock of a nominal amount of £4,255.

Hick, Hargreaves & Co., Ltd., are increasing the final dividend for 1941–42 to 8 per cent., making 10 per cent. for the year. For the previous year the final dividend was 5 per cent., making 7 per cent.

W. & T. Avery, Ltd., report a net profit for the year ended March 31st, of £130,407, as compared with £130,661 for the preceding year. The final ordinary dividend is 10 per cent., again making 15 per cent. for the year.

Christy Bros., Ltd., are paying a dividend of 12½ per cent. as compared with 11 per cent. for the preceding year.

Harland & Wolff, Ltd., are maintaining the "A" and "B" ordinary dividends at 6 per cent. for 1941.

Mirrlees, Bickerton & Day, Ltd., are again paying a dividend of 6 per cent.

New Companies

Merritt, Partner & Co., Ltd.—Private company. Registered June 12th. Capital, £3,000. Objects: To acquire the business of an engineer and electrical manufacturer carried on by Llewellyn Merritt at Kirke White Street, Nottingham, as Merritt, Partner & Co. Joint

managing directors : L. Merritt, 39, Hollinwell Avenue, Wollaton Road, Nottingham, and J. Paling, Eldon Chambers, Wheeler Gate, Nottingham. Solicitors : Palmer and Paling, Nottingham.

Ronald L. Christiansen, Ltd.—Private company Registered June 15th. Capital, £1,000. Objects : To carry on the business of electrical, mechanical and general engineers and contractors, manufacturers of, and dealers in, dynamos, motors, armatures, batteries, insulating materials and engineers' supplies, etc. R. C. Christiansen, 205, Norwood Road, Southall, Middlesex is the first director. Registered office : 214, Alexandra Avenue, South Harrow, Middlesex.

Companies' Returns

Statements of Capital

Adelaide Electric Supply Co., Ltd.—Capital £3,625,000 in £2,250,000 preference stock, £750,000 preferred ordinary stock and £625,000 ordinary stock. Return dated December 4th, 1941 (filed April 17th). All stock taken up. £3,370,000 paid on £2,250,000 preference stock, £750,000 preferred ordinary stock and £370,000 ordinary stock. £255,000 considered as paid on £255,000 ordinary stock. Mortgages and charges : £1,744,209.

Central London Electricity, Ltd.—Capital, £6,914,760 in £4,663,700 ordinary stock, £1,405,000 4½ per cent. preference stock, £202,909 6 per cent. preference stock and 643,151 shares of £1 each of no denomination. Return dated April 1st. All preference and ordinary stock taken up. £1,280,000 paid. £4,991,609 considered as paid. Mortgages and charges : £1,272,301.

Keswick Electric Light Co., Ltd.—Capital, £30,000 in 5,000 preference and 25,000 ordinary shares of £1. Return dated April 2nd. 4,000 preference and 25,000 ordinary shares taken up. £23,000 paid on 23,000 ordinary shares. £6,000 considered as paid on 4,000 preference and 2,000 ordinary shares. Mortgages and charges : Nil.

Llanelly and District Electric Supply Co., Ltd.—Capital, £1,400,000 in £1 shares (660,000 6 per cent. cumulative preference, 660,000 ordinary and 80,000 undenominated). Return dated April 2nd. 660,000 preference and 660,000 ordinary shares taken up. £1,314,000 paid. £6,000 considered as paid. Mortgages and charges : Nil.

Electrical Distribution of Yorkshire, Ltd.—Capital, £3,200,000 in £1,200,000 6 per cent. cumulative preference stock, £1,500,000 ordinary stock and £500,000 unissued stock. Return dated March 30th (filed April 27th). All preference and ordinary stock taken up. £2,700,000 paid. Mortgages and charges : £500,000.

Petersfield Electric Light & Power Co., Ltd.—Capital, £40,000 in £1 shares (30,000 ordinary and 10,000 preference). Return dated March 19th, 1942. All shares taken up. £40,000 paid. Mortgages and charges : Nil.

Whittaker Bros., Ltd.—Capital, £7,000 in £1 shares (1,000 cumulative preference, 5,000 "A" ordinary and 1,000 "B" ordinary). Return dated December 31st, 1941 (filed February 3rd, 1942). 3,907 shares taken up. £3,207 paid. £700 considered as paid. Mortgages and charges : Nil.

Vulco Dry Battery Co., Ltd.—Capital, £8,000 in £1 shares (1,500 preference and 6,500 ordinary Return dated December 31st, 1941 (filed March 16th, 1942). All shares taken up. £3,667 paid. £4,333 considered as paid. Mortgages and charges : Nil.

Oliver Electrical Supplies Co., Ltd.—Capital £100 in 100 shares of £1 each. Return dated March 9th. All shares taken up. £100 paid. Mortgages and charges : Nil.

Newcastle & District Electric Lighting Co., Ltd.—Capital, £600,000 in £1 shares. Return dated April 3rd, All shares taken up. £600,000 paid. Mortgages and charges : £350,000.

Alliance Electrical Co., Ltd.—Capital, £2,500 in £1 shares. Return dated April 22nd. 1,330 shares taken up. £502 paid. £828 considered as paid. Mortgages and charges : Nil.

Mortgages and Charges

British Electric Resistance Co., Ltd.—Debenture, charged on cash, stock in trade, work in progress, benefit of contracts and book debts, present and future, dated June 23rd, 1942, to secure all moneys due or to become due from the company to Barclays Bank, Ltd.

North-Eastern Electric Supply Co., Ltd.—Satisfaction to the further extent of £27,010 on June 16th, 1942, of £1,500,000 3½ per cent. consolidated debenture stock secured by trust deed dated August 1st, 1935, and registered August 13th, 1935.

Wessex Electrical Service Co., Ltd.—Debenture dated June 4th, 1942, to secure £2,000, charged on the company's undertaking and property, present and future, including uncalled capital.

Underwood (Electric), Ltd.—Assignment of contract moneys, dated June 18th, 1942, to secure all moneys due or to become due from the company to Martins Bank, Ltd., not exceeding £300.

J. J. Eastick & Sons, Ltd.—Satisfaction in full on May 12th, 1939, of debenture registered November 23rd, 1938, securing all moneys not exceeding £10,000. (Notice filed June 2nd, 1942.)

Bankruptcies

I. F. Berners and **C. J. Berners** (Major Manufacturing Co.), battery manufacturers, 98, Great Tower Street, London, E.C.—Mr. S. E. Lane, Salisbury House, Finsbury Circus, London, E.C.2, appointed trustee on June 24th in place of Mr. M. M. Donn.

Liquidations

Costa Rica Electric Light & Traction Co., Ltd.—At a meeting of members held in New York on June 23rd a resolution was passed for the voluntary winding up of the company with Mr. R. A. Hamlyn, River Plate House, 12 and 13, South Place, London, E.C.2, as liquidator.

Sun-lite Lamp Co., Ltd.—Meetings August 7th at the offices of Allen Edwards & Co., 5 Lower Temple Street, Birmingham, to receive an account of the winding up by the liquidator, Mr. A. Canlett.

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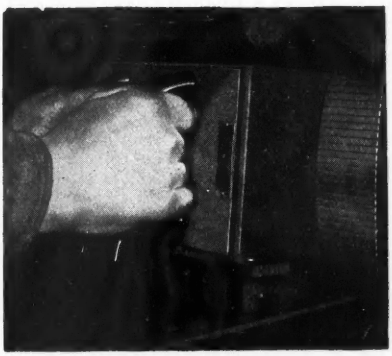

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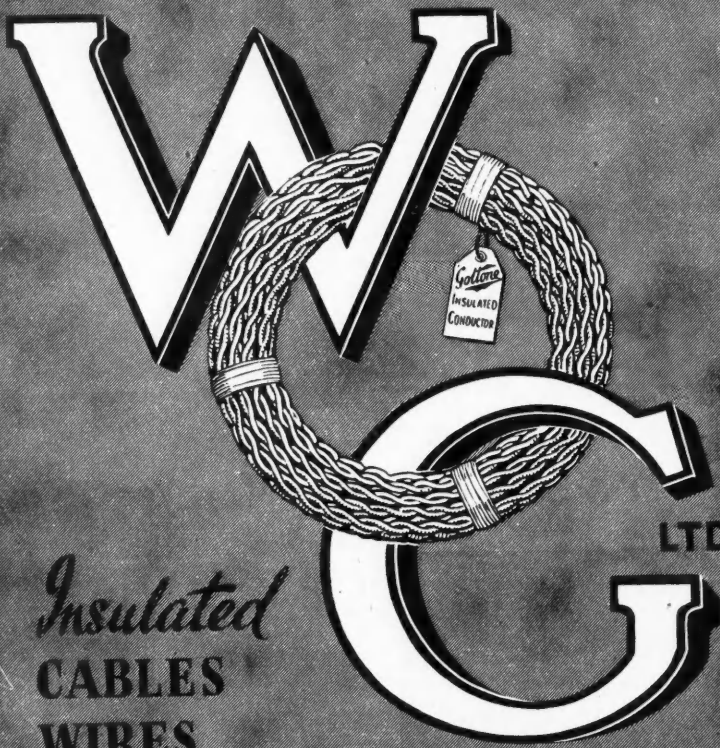

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STOCKS AND SHARES

TUESDAY EVENING.

THE firmness of Stock Exchange prices in the face of war news which can hardly be considered satisfactory furnishes matter for surprise to most people, whether in the Stock Exchange or out of it. The question is constantly asked why quotations should remain as hard as they do. The answer offers always the same humdrum explanation that cheap money, lack of new issues and accumulation of capital are the three main causes of the strength of to-day's quotations and of the modesty of return which investment is content to receive from first-rate Stock Exchange securities. The strike threat of the railway men produced no effect in the Home Railway market.

Communications Stocks

Cable and Wireless ordinary stock failed to fulfil the expectations of its stockholders who were looking for a recovery to follow upon the chairman's statement at the meeting. The price at 59 x.d. shows a partial recovery of the dividend of 2 per cent. net. The 5½ per cent. preference changes hands fairly regularly around 101, at which price the stock makes a useful mixer for inclusion with those which pay a lower rate of yield on the money. Anglo-American Telegraphs have failed to recover from the dullness which attacked them last week.

Tilling and British Automobile

Details are now available of the division of the Tilling and British Automobile Traction Co. into two different undertakings. One is to be called Tilling Motor Services; the other, B.E.T. Omnibus Services. The intention is to make two entirely distinct concerns, operating independently of one another and, at any rate from the outset, not holding each other's shares. The shares of the present company are held to a small extent by the public. There will be a market in the shares in the new companies when the formalities are completed. The present price is about 55s., at which the yield on the money, on the basis of the last-paid 6½ per cent. free of tax dividend, is £2 7s. 3d. per cent. net.

Overseas Shares

The Palestine Electric Corporation has returned to the dividend list with 4 per cent. tax free on its ordinary shares for the year ended December 31st, 1941. The dividend service on the ordinary shares has been intermitted since 1938, the last distribution having been 5 per cent. net for the year 1937. Prior to this, four years produced 7½ per cent. free of tax annual dividend. On the present announcement, which was not entirely unexpected, the price of the shares recovered to 20s. after its fall of 3s., to 18s. 3d. a week ago, when Rommel's advance had an opposite effect upon prices of shares in Near East companies. Among other overseas shares, Kalgoorlie Electric are nominally unchanged at 7s. 6d. ex the reduced dividend, making 5 per cent. These shares seldom change hands; the last bargains marked officially were both at 7s. in the middle of May. Mexican Light issues are less in favour. The company's first mortgage bonds remain at 85, but the seconds, which were run up to over 60 last month, have relapsed to 54. Victoria Falls ordinary at 72s. 6d. x.d. are about 1s. 6d. down on balance, allowing for deduction of the dividend. The preference have gone back to 33s. 9d. Publication of the Whitehall Electric Investment figures left the price unchanged at 15s. 9d.

Price Fluctuations

Aron Electric shares are 1s. better at 25s. and Electric Constructions at 34s. 6d. have regained deduction of the dividend. Murex are ⅛ up at 92s. 6d.; Tube Investments 1s., at 83s. 6d.; Siemens' preference rose to 41s.3d. Henley's ordinary at 22s. 6d. are quotably unchanged, ex 4½d. dividend. Strand Electrics hardened to 4s. 3d. Small falls have occurred in Vickers, Enfield Cables, Mather & Platt and Ever Ready shares. Among Home Electricity issues, Southern Areas have eased off to £1; Northmet preference to 31s. Home Railway stocks leaned slightly to the dull side and Thomas Tilling at 47s. 6d. are ⅛ lower. Among foreigners, Anglo-Argentine 4 per cent. income stock at 9½ shows a drop of 2 points.

Six Months' Rises

Last week a series of tables of comparative prices were set out to show the fluctuations which had occurred during the first six months of the present year. The previous list of manufacturing and equipment shares may be usefully supplemented with further illustrations.

Ordinary Shares	Dec., 1941	July 7, 1942	Rise or Fall
	s. d.	s. d.	
Automatic Tel. & Elec.	48/9	51/3	+ ⅛
Crabtree (10s.) ..	28/3	30/-	+ 1/9
Elec. & Musical Ind. (10s.)	15/-	15/9	+ 9d.
Elec. Construct. ..	34/6	34/6	—
Enfield Cable Ord. ..	53/9	53/9	—
Ericsson Tel. (5s.) ..	40/-	41/3	+ 1/16
Lancs. Dynamo ..	65/-	67/6	+ ¼
Mather & Platt ..	41/3	38/9	— ⅛
Reyrolle	56/3	57/6	+ 1/16
Telegraph Construction	41/3	42/6	+ 1/16
Westinghouse Brake ..	51/3	47/6	— 3/16

It is obviously impossible to set out more than a certain proportion of the electrical companies in whose shares public interest resides, but the above table bears witness to

(*Concluded on page* 63)

ELECTRICAL INVESTMENTS

Prices, Dividends and Yields

Company	Dividend 1939–40	Dividend 1940–41	Middle Price July 7	Rise or Fall	Yield p.c. £ s. d.
Home Electricity Companies					
Bournemouth and Poole	12½	12½	52/6	..	4 15 0
British Power and Light	6	6	28/–	..	4 5 9
City of London	7	7	27/6	..	5 1 9
Clyde Valley	8	8	40/–	..	4 0 0
County of London	8	8	37/6	..	4 5 6
Edmundson's:					
7% Pref.	7	7	34/6xd	..	4 1 2
Ord.	6	6	28/–	..	4 5 9
Elec. Dis. Yorkshire	9	9	42/–	..	4 5 9
Elec. Fin. and Securities	12½	12½	48/9	..	5 2 6
Elec. Supply Corporation	10	10	45/–	..	4 9 0
Isle of Thanet	2	Nil	11/3	..	—
Lancs. Light and Power	7½	7½	34/6	..	4 7 0
Llanelly Elec.	5½	5½	22/6	..	4 17 9
Lond. Assoc. Electric	4½	4	19/6	..	4 2 1
London Electric	6	6	25/–	..	4 16 0
London Power Red. Deb.	5	5	105½	..	4 14 7
Metropolitan E.S.	8	8	36/3	..	4 8 6
Midland Counties	8	8	38/9	..	4 2 6
Mid. Elec. Power	9	9	42/–	..	4 5 9
Newcastle Elec.	7	7	27/6	..	5 1 10
North Eastern Elec. Ordinary	7	7	31/3	..	4 9 7
7% Pref.	7	7	34/–	–6d.	4 2 4
Northampton	10	10	47/–	..	4 5 1
Notting Hill 6% Pref. (£10)	6	6	9	..	—
Northmet Power:					
Ordinary	7	7	35/9	..	3 18 4
6% Pref.	6	6	31/–	–1/–	3 17 5
Richmond Elec.	6	6	25/–	..	4 16 0
Scottish Power	8	8	39/6	..	4 1 0
Southern Areas	5	5	20/–	–⅛	5 0 0
South London	7	7	27/6	..	5 1 10
West Devon	5	5	22/6	..	4 9 0
West Glos.	4½	3½	20/–	..	3 10 0
Yorkshire Elec.	8	8	40/–	..	4 0 0
Overseas Electricity Companies					
Atlas Elec.	Nil	Nil	4/3	..	—
Calcutta Elec.	7*	7*	25/–	..	5 12 0
Cawnpore Elec.	10	10	25/–	..	8 0 0
East African Power	7	7	27/–	..	5 3 8
Jerusalem Elec.	7	5	18/9	..	5 6 8
Kalgoorlie (10/–)	7½	5	7/6	..	6 13 4
Madras Elec.	6*	4*	18/9	..	4 5 4
Montreal Power	1½	1½	23½	..	6 7 8
Palestine Elec. "A"	Nil	4*	20/–	+1/9	4 0 0
Perak Hydro-elec.	6	7	7/6	..	—
Shawinigan Power	83cts.	90cts.	14	..	—
Tokyo Elec. 6%	6	6	12	..	—
Victoria Falls Power	15	15	72/6xd	–1/6	4 2 8
Whitehall Inv. Pref.	5	5	15/9	..	6 7 0

Company	Dividend 1939–40	Dividend 1940–41	Middle Price July 7	Rise or Fall	Yield p.c. £ s. d.
Public Boards					
Central Electricity:					
1950–70	5	5	110½	..	4 10 6
1955–75	5	5	115	..	4 7 0
1951–73	4½	4½	107½	..	4 3 7
1963–93	3½	3½	103½	..	3 7 8
1974–94	3¼	3¼	99½	..	3 5 4
London Elec. Trans. Ltd.	2½	2½	95½xd	..	2 12 4
London & Home Counties 1955–75	4½	4½	109xd	–2	4 2 7
Lond. Pass. Trans.:					
A	4½	4½	112½	–1	4 0 0
B	5	5	112½	..	4 9 0
C	3	2⅞	41	..	7 0 3
West Midlands J.E.A. 1948–68	5	5	110	..	4 11 0
Telegraph and Telephone					
Anglo-Am. Tel.:					
Pref.	6	6	110	..	5 9 1
Def.	1½	1½	25	..	6 0 0
Anglo-Portuguese	8	8	17/6	..	9 2 10
Cable & Wireless:					
5½ Pref.	5½	5½	101	+1	5 8 9
Ord.	4	4	59	–½	6 15 7
Canadian Marconi $1	Nil	4cts.	5/–	..	3 7 0
Globe Tel. & Tel.:					
Ord.	8½*	8¼*	27/6	..	—
Pref.	6	6	27/6	..	4 7 5
Great Northern Tel.:					
(£10)	Nil	Nil	15½	..	—
Inter. Tel. & Tel.	Nil	Nil	3⅞	..	—
Marconi-Marine	7½	7½	28/9	..	5 4 4
Oriental Tel. Ord.	11½*	16	47/6	..	6 14 8
Telephone Props.	6	Nil	10/–	..	—
Tele. Rentals (5/–)	10	10	9/–	..	5 11 1
Traction and Transport					
Anglo Arg. Trans.:					
First Pref. (£5)	Nil	Nil	5/–	..	—
4% Inc.	Nil	Nil	9½	–2	—
Brit. Elec. Traction:					
Def. Ord.	45	45	900	..	5 0 0
Pref. Ord.	8	8	170	..	4 14 2
Bristol Trams	8	10	46/3	..	4 6 4
Brazil Traction	$1	50c	14⅜	..	—
Calcutta Trams	8	5½	18/3	..	6 0 9
Cape Elec. Trams	5	5	20/–	..	5 0 0
Lancs Transport	10	10	43/9	..	4 11 1
Mexican Light:					
1st Bonds	5	5	85	..	5 17 0
Rio 5% Bonds	5	5	99	..	5 1 0
Southern Rly.:					
5% Prefd.	5	5	62½	–½	8 0 0
5% Pref.	5	5	106	..	4 14 4
T. Tilling	10	10	47/6	–⅛	4 4 3
Tilling & B.A.	7*	6½*	55/–	..	2 7 3
West Riding	10	10	39/6	..	5 1 3

(Continued on next page)

* Dividends are paid free of Income Tax.

Company	Dividend 1939–40	Dividend 1940–41	Middle Price July 7	Rise or Fall	Yield p.c.
Equipment and Manufacturing					
					£ s. d.
Aron Elec. Ord. ..	Nil	7½	25/–	+1/–	6 0 0
Assoc. Elec. :					
Ord.	10	10	45/9	..	4 7 6
Pref.	8	8	39/6	..	4 1 0
Automatic Tel.& El.	12½	12½	51/3	..	4 17 3
Babcock & Wilcox	11	11	42/6	..	5 3 6
British Aluminium	10	10	44/6	..	4 10 1
British Insul. Ord.	20	20	93/9	..	4 5 6
British Thermostat (5/–)	18½	18½	16/3	..	5 13 10
British Vac. Cleaner (5/–)	12½	10	13/9	..	3 12 9
Brush Ord. (5/–) ..	Nil	6	5/9	..	5 4 3
Callender's ..	15	15	72/6xd	..	4 2 9
Chloride Elec.Storage	15	15	73/9	..	4 1 4
Cole, E. K. (5/–) ..	Nil	7	11/6	..	3 0 10
Consolidated Signal	17	17	72/6	..	4 3 8
Crabtree (10/–) ..	17½	17½	30/–	..	5 16 8
Crompton Parkinson Ord. (5/–) ..	30	20	22/6	..	4 9 0
E.M.I. (10/–) ..	Nil	6	15/9	+3d.	3 16 5
Electric Construction	10	10	34/6xd	+1/–	5 16 0
Enfield Cable Ord.	12½	12½	53/9	–⅛	4 13 0
Elecl. Switchgear (10/–)	10	10	20/–	..	5 0 0
English Electric ..	10	10	41/3	..	4 17 0
Ensign Lamps (5/–)	25	25	16/3	..	7 13 10
Ericsson Tel.(5/–)	22*	20*	41/3	..	2 8 6
Ever Ready (5/–)	40	40	32/–	–6d.	6 5 0
Falk Stadelmann	7	7½	22/–	..	6 16 4
Ferranti Pref. ..	7	7	27/6	..	5 1 10
G.E.C. : Pref.	6½	6½	32/6	..	4 0 0
Ord.	20	17½	82/–	..	4 5 4
Greenwood & Batley	15	13	30/–	..	8 13 4
Hall Telephone(10/–)	10	12½	20/–	..	6 5 0
Henley's (5/–) ..	20	20	22/6xd	+4½d.	4 9 1
4½% Pref. ..	4½	4½	22/6	..	4 0 0
Hopkinsons ..	15	15	48/9	..	6 3 0
India Rubber Pref.	5½	5½	18/9	..	5 17 6
Intl. Combustion..	32½	30	105/–xd.	–2/–	5 14 3
Johnson & Phillips	15	15	60/–	..	5 0 0
Lancashire Dynamo	20	20	67/6	..	5 18 4
Laurence, Scott (5/–)	15	12½	9/6	..	6 11 7
London Elec. Wire	7½	7½	28/3	..	5 6 2
Lucas, J.	15	15	66/3	..	4 10 8
Mather & Platt ..	10	10	38/9	–9d.	5 3 3
Met.Elec.Cable Pref.	5½	5½	21/3	..	5 3 6
Murex	20	20	92/6	+⅛	4 6 7
Pye Deferred (5/–)	25	25	16/3	..	7 13 10
Revo (10/–) ..	20	17½	28/9	..	6 1 9
Reyrolle	12½	12½	57/6	..	4 7 0
Siemens Ord. ..	7½	7½	26/3	..	5 14 3
Smith, S. (1/–) ..	50	37½	7/–	..	5 7 2
Strand Elec. (5/–)	2	4	4/3	+6d.	4 14 2
Switchgear & Cow-and (5/–) ..	15	10	10/–	..	5 0 0
T.C.C. (10/–) ..	Nil	5	15/–	..	3 6 8
T.C. & M... ..	10	10	42/6	..	4 14 0
Telephone Mfg.(5/–)	9	9	9/–xd.	..	5 0 0
Thorn Elec. (5/–)	20	20	13/–	..	7 13 10
Tube Investments	23¾	20	83/6	+1/–	4 15 8
Vactric (5/–) ..	Nil	Nil	6/–	..	—
Vickers (10/–) ..	10	10	16/–	–3d.	6 5 0
Ward & Goldstone (5/–)	20	20	18/6	..	5 8 3
Westinghouse Brake	10	10	47/6	..	4 4 2
Walsall Conduits(4/–)	55	55	36/3	..	6 4 6
West, Allen (5/–)..	7½	7½	5/9	..	6 10 5

* Dividends are paid free of Income Tax.

Stocks & Shares (*Continued from page* 61)

the respect in which the shares of most of the companies are held. It also illustrates the tenacity with which proprietors retain investments which, in the majority of cases, are quoted at what seem to be fairly high figures in relation to the yield which they afford at the currently paid rate of dividends.

Telegraph & Wireless

In order to make the tables more complete it is necessary to add half-a-dozen examples of prices in the telegraph and telephone group. It will be noticed that Cable & Wireless ordinary, in spite of the maintenance of the dividend at 4 per cent. for last year, has shed 6½ points within as many months.

Stock or Share	Dec., 1941	July 7, 1942	Rise or Fall
Anglo-American pref.	105¼	110	+ 4¾
Cable & Wireless pref.	101½	101	– ½
Cable & Wireless ord.	65½	59	– 6½
Great Northern ..	14½	15½	+ 1
International Tel. & Tel.	3	3¾	+ ¾
Marconi Marine ..	27/6	28/9	+ 1/16

Shares in Demand

To give concrete instances of the manner in which investment demands preference shares, it may be of service to quote a selection of those which are wanted in the market at the present time, and the prices which buyers are prepared to pay for anything between a thousand and five thousand shares of each.

Preference Share	Dividend per cent.	Prices
City of London Elec. ..	6	28/-
Lancashire Elec. Light..	6 tax free	35/6 xd
London Elec. non-cum.	6	5⅝
Midland Counties Elec.	4¼	22/-
North-Eastern Electric	7	33/6
Scottish Power	4	21/3
West Kent Electric ..	4½	22/-

As for debenture stocks, at least two dozen of them can be sold in amounts of £5,000 apiece at prices which pay barely 3½ per cent. on the money. They would look overvalued were it not for the gilt-edged character of the security and the difficulty that would be experienced in replacing the stock with anything similar at a cheaper level.

NEW PATENTS

Electrical Specifications Recently Published

The numbers under which the specifications will be printed and abridged are given in parentheses. Copies of any specification (1s. each) can be obtained from the Patent Office, 25, Southampton Buildings, London, W.C.2.

1939

28248. "High-vacuum hot-cathode tubes." Akt.-Ges. Brown, Boveri & Cie. October 19th, 1938. (545801.)

1940

2694. "Vacuum tube apparatus." Machlett Laboratories, Inc. March 10th, 1939. (545693.)

9195. "Electric arc furnaces." Electric Furnace Co., Ltd., J. R. Spanswick and S. G. King. May 24th, 1940. (545777.)

10263. "Circuit arrangements for amplifying and separating two or more oscillations." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken.) June 12th, 1940. (Convention date not granted.) (545803.)

10636. "Devices for finding the direction and or distance of stationary or moving bodies." Philips Lamps, Ltd. (Naamlooze Vennootschap Philips' Gloeilampenfabrieken). June 20th, 1940. (Convention date not granted.) (545778.)

11928. "Sound recording systems." Radio Corporation of America. July 29th, 1939. (545761.)

13009. "Relaying and transmitting high-frequency waves along wave guides." Board of Trustees of Leland Stanford Junior University. August 24th, 1939. (545779.)

15172. "Radio filter circuits employing piezo-electric crystals." Marconi's Wireless Telegraph Co., Ltd., and A. T. Starr. October 11th, 1940. (545804.)

15886. "Apparatus for the detection of noxious gases in air." Standard Telephones & Cables, Ltd., C. E. Brigham and D. S. B. Shannon. October 30th, 1940. (545698.)

16081. "Dynamo-electric instruments." S. Smith & Sons (Motor Accessories), Ltd., E. B. Moss and E. C. Klepp. November 4th, 1940. (Addition to 537833.) (545730.)

16361. "Electrical therapeutical apparatus and method." E. L. W. Byrne (A. D. Cardwell Manufacturing Corporation). November 11th, 1940. (545700.)

17373. "Control of battery charging in vehicle installations." J. Stone & Co., Ltd., A. H. Chilton and C. J. H. Bolton. December 6th, 1940. (545705.)

17413. "Battery charging equipment." Standard Telephones & Cables. Ltd., and E. A. Richards. December 7th, 1940. (Addition to 516135.) (545706.)

17414. "Transformer and like coils, comprising paper impregnated with polymerised material." Standard Telephones & Cables, Ltd., and E. C. Lee. December 7th, 1940. (545707.)

17561. "Progression of work through furnaces." G. H. S. Grene and Wild-Barfield Electric Furnaces, Ltd. December 11th, 1940. (545787.)

17603–5. "Electric ignition apparatus for internal-combustion engines." J. Lucas, Ltd., and E. A. Watson. December 12th, 1940. (545815–7.)

17606. "Make-and-break devices for electric ignition apparatus." J. Lucas, Ltd., and F. J. Marlow. December 12th, 1940. (545818.)

17623. "Ignition coils for internal-combustion engines." Bendix Aviation Corporation. December 21st, 1939. (545821.)

17864. "Electrical insulating materials." British Thompson-Houston Co., Ltd. December 19th, 1939. (545709.)

18228. "Vacuum cleaners." British Thomson-Houston Co., Ltd. December 28th, 1939. (545711.)

1941

568. "Electric signal injecting systems." Rediffusion, Ltd., and P. M. Brand. January 15th, 1941. (545714.)

1326. "Microphones." Marconi's Wireless Telegraph Co., Ltd. January 31st, 1940. (545790.)

2837. "Commutators for dynamo-electric machines." Ellison Insulators, Ltd., E. J. P. Reynolds, J. Lucas, Ltd., and P. C. Strong. March 3rd, 1941. (545794.)

3120. "Air-blast electric circuit interrupters." Westinghouse Electric International Co. March 9th, 1940. (545738.)

3891. "Cases for electric fuses or the like." K. E. Beswick. March 21st, 1941. (545740.)

4282. "Socket couplings, switch sockets and electrical apparatus." J. A. Crabtree & Co., Ltd., H.F. McLoughlin and R. W. Morgan. March 31st, 1941. (545743.)

4316. "Temperature correction of AC watt-hour meters and other instruments." Venner Time Switches, Ltd., S. J. Matthews, S. P. Kendon and A. W. Dean. March 31st, 1941. (545744.)

4542. "Amplifier coupling circuits." British Thomson-Houston Co., Ltd. April 5th, 1940. (545827.)

4832. "Electrical cartridge fuses." Belling & Lee, Ltd., and A. L. Hodby. April 11th, 1941. (545745.)

5064. "Electric-discharge devices for producing radiant energy." Hanovia, Ltd. May 18th, 1940. (545747.)

7302. "Electric wiring systems." J. F. O'Brien. June 9th, 1941. (545719.)

7472. "Electrical systems of control for lifts." Express Lift Co., Ltd., and S. T. Hunt. June 13th, 1941. (545755.)

8225. "Video-frequency signal translating system for television receivers." Hazeltine Corporation. July 23rd, 1940. (545756.)

8386. "Electric lampholders." S. D. Sullam. July 3rd, 1941. (Cognate application, 8387/41.) (545797.)

11958. "Instrument type relays." Sangamo Weston, Ltd. March 1st, 1941. (545757.)

12050. "Mercury interrupters." General Motors Corporation. November 4th, 1940. (545799.)

Amended Specification

527496. "Automatically variable frequency selective electric wave filters." Marconi's Wireless Telegraph Co., Ltd., and others.

Supply in Ulster

Three Emergency Stations

(From our Belfast Correspondent)

THREE stand-by sources of supply of electricity for Northern Ireland are either operating now or are well advanced towards completion. This information was given by Sir Basil Brooke, Ulster Minister of Production in the Northern Ireland Parliament. Sir Basil, who was moving the second reading of the Electricity (Emergency Supplies) Bill said they had received financial assistance from the United Kingdom Government.

The general purpose of the Bill, he said, was to provide for the maintenance of an adequate supply of electricity in war-time whatever might be the emergency. He did not propose to enter into any discussion of the primary responsibility for the provision of alternative or stand-by supplies of electricity. It was sufficient to say that a definite obligation was laid on electricity undertakings to take steps to secure the functioning of their stations in the event of hostile attack. The fulfilment of this obligation by Belfast Corporation had been subject to such procrastinations and postponements that at last the Government decided to permit of no further delay in making sure of the power supplies required for the war effort, he said.

He assured the House that his powers would be used solely for that purpose and if any evidence was needed on that point he would indicate that there were provisions in the Bill which prohibited the compulsory acquisition of the undertakings of the county boroughs. In his view, if the compulsory acquisition of those two undertakings had been provided for in the Bill, it would have infringed peace-time policy and, moreover, any question of merger would have taken a long time to settle. Accordingly no such provision appeared in the Bill. Provision was made, however, that in a serious emergency the Government could direct the operation of the whole, or part of the electricity supply system of the province to the end that it would be used to the best advantage in the national interest. At the same time the provision made for such an emergency was capable of being used for the purpose of ensuring that the electricity supplies were used to the best advantage at any time in the national interest and in the most economical manner possible.

The question of the ultimate ownership of the stand-by stations did not arise under the Bill as it was a matter which must wait a definition of post-war policy.

The Bill was given a second reading.

Belfast Engineer's Views

A memorandum prepared by the city electrical engineer of Belfast (Mr. W. J. Girvan) setting out proposed amendments to the Bill was recently considered by the Electricity Committee. The memorandum suggests that the period of the Bill should be clearly defined and that the Ministry should remove any ambiguity regarding its power to transfer the Belfast undertaking. The deletion of a sub-section is recommended in order to put all undertakings, including the Ministry, on an equal footing. Another amendment suggested is that undertakings receiving a bulk supply from a selected station should not discontinue or substantially reduce the purchases of electricity from the station without giving compensation. Mr. Girvan contends that the Bill should be amended to include a schedule for determining the cost of production at all generating stations and to exclude all references to apportionment of deficiency, which should be met by means of a Treasury grant.

Parliamentary News

By Our Special Reporter

Fuel Rationing Questions

MAJOR LLOYD GEORGE, the Minister of Fuel and Power, was called upon to answer a number of questions on rationing in the House of Commons last week.

Sir Herbert Williams asked how coal merchants would be able to forecast their requirements when the householder might vary the quantity of coal which he ordered during the rationing period. Major Lloyd George said he realised that under the proposed coupon and points scheme there would be difficulty in estimating the requirements of domestic fuel. He hoped that Local Fuel Overseers would be able to provide estimates of the coal requirements as measured by the household assessments which were to be made soon, with a deduction for the estimated consumption of gas and electricity. It was possible that consumers would change from one form of fuel to another, but he thought that in any given area the ratio between the various types of fuel would remain generally unchanged, thus enabling reasonably accurate estimates to be made.

Reporting Excess Consumption

Sir Herbert Williams then asked how it was proposed that the gas and electricity undertakings were to report excess consumptions of these commodities by consumers, who might vary their use of coal, gas, and electricity under the coupons and points plan.

Major Lloyd George replied that if the rationing scheme mentioned was brought into operation gas and electricity undertakings would be required to make a report to the Local Fuel Overseer when a householder was unable or unwilling to surrender coupons to the full value of the consumption recorded at the meter reading.

Mr. Higgs asked why, under the plan, consumers of electricity were to be allowed to consume the same as in the previous year.

Major Lloyd George said that the hon. member was mistaken. A householder would, in general, be able to consume as much as he desired of *any* rationed fuel, provided that his total consumption of all rationed fuels did not exceed the value of the fuel coupons at his disposal.

Answering further questions, the Minister said he was aware that there was much unnecessary use of light in " fun fairs " and shop windows, but, under the Order which he had just made, those responsible for waste or uneconomical use of fuel there or elsewhere would be liable to prosecution.

CONTRACT INFORMATION

Accepted Tenders and Prospective Electrical Work

Contracts Open

Where "Contracts Open" are advertised in our "Official Notices" section the date of the issue is given in parentheses.

Belfast.—July 15th. Civil Defence Authority. Electric lighting installations in air-raid shelters. Particulars from Civil Defence Headquarters, 97, Lisburn Road, Belfast.

Bury.—July 13th. Town Council. Electrical installation at wartime nursery, Maxwell Street. Particulars from the borough engineer, Bank Street.

Dublin.—July 24th. Commissioners of Public Works. Electric lighting installation at Crumlin North boys' and girls' and infants' national schools. Specifications from T. P. Fagan, secretary, Office of Public Works, Dublin.

Normanton.—July 11th. Electricity Department. Supply, delivery and laying of 440 yd. of e.h.v. cable and supply, delivery and fixing of one e.h.v. switch cubicle with instruments. Specifications from electrical engineer, Electricity Department. (June 26th.)

Wolverhampton.—July 13th. West Midlands Joint Electricity Authority. High-voltage and low-voltage cables. (June 26th.)

Orders Placed

Birkenhead.—Electricity Committee. Accepted for twelve months: Cables.—Wm. Geipel; Hackbridge Cable Co.; Mersey Cable Co.; Britannic Electric Cable & Construction Co.; Aberdare Cables. Meters.—English Electric Co.; Landis & Gyr; Sangamo Weston; Ferranti.

Manchester.—Electricity Committee. Accepted. 6,600-V switchgear.—A. Reyrolle & Co. Coal-handling plant.—W. J. Jenkins & Co. Electrically-operated wagon tippers.—Babcock & Wilcox.

Accepted for twelve months: Adhesive tape.—Lindsay & Williams, Ltd.; L. Andrew & Co. Asbestos, etc., goods.—L. Andrew & Co.; Geo. Angus & Co.; G. Maclellan & Co. Batteries, etc., for flashlight lamps.—S. Gratrix; G.E.C. Cable cover tiles and concrete slabs.—H. J. Baldwin & Co.; Cable covers.—Callender's. Conduit and accessories for wiring.—L. Andrew & Co. Insulating cloth.—Hamnett & Andrew. Lead sleeves and pig lead.—Baxendale & Co.; Walkers, Parker & Co. Service boxes.—W. Lucy & Co. Steam and water tubes and fittings, etc.—S. Gratrix. Tail end boxes.—Johnson & Phillips; Aero Engines,Ltd. Insulating tapes.—Callender's; Henley's; L. Andrew & Co.; Ryknéld Mills Co.

Sheffield.—Electricity Committee. Contract for cables extended for twelve months.—W. T. Glover & Co.

Shipley.—Electricity Committee. Accepted. Switchgear modification (£694).—English Electric Co.

Contracts in Prospect

Particulars of new works and building schemes for the use of electrical installation contractors and traders. Publication in this section is no guarantee that electrial work is definitely included. Alleged inaccuracies should be reported to the Editors.

Birkenhead.—Canteen, Beaufort Road; Moon Bros.

Carlisle.—Additional temporary school accommodation at Harraby for the City Council (£3,700); city engineer, 18, Fisher Street.

Chester.—Main switching substation; S. & J. Seddon, Ltd., building contractors, 5, Manchester Road West, Little Hulton, near Bolton.

Hexham.—British Restaurant; U.D.C. and R.D.C. surveyors.

Manchester.—Heating, with electrical work, at Limbert Homes (£2,300); city engineer.

Nurseries (£11,000); city architect.

Middleton.—Canteen and sanitary accommodation at Avon Mill for Avon Mill (1919), Ltd.; E. S. England, architect, 12, Clegg Street, Oldham.

Raunds.—Additions; Strong & Fisher, Irchester Road, Rothwell, Northants.

Sheffield.—School meals huts (£2,260); city engineer.

Adaptation and equipment at the Junior Technical School (£4,000); W. George Davies, city architect, Town Hall.

Licensed premises, Charles Street and Union Street; H. Tomlinson, Ltd., brewers, Anchor Brewery, Sharrow, Sheffield, 2.

Sunderland.—Communal feeding centres and British Restaurants at Tunstall and Castletown; C. Emmerson, surveyor, R.D.C. offices, The Esplanade, Sunderland.

Garage, Hutchinson's Buildings, Mowbray Road, for vehicles and vans for the Education Committee, and conversion of Junior Instruction Centre, Prospect Road, and premises in Hylton Road, into school canteens; O. H. Mark, Education Offices, Tatem Street, Sunderland.

Hutments for the National Fire Service; borough engineer, Town Hall.

I.E.E. Students' Premiums

THE Council of the Institution of Electrical Engineers has awarded the following premiums for students' papers for the 1941–42 session :—

Students' Premiums (value £10).—Messrs. B. Calvert, B.Sc. (Eng.) (Sheffield), W. P. Jones (Bath), R. A. Joseph (Wolverhampton) and D. Little, B.Sc. (Newcastle-on-Tyne). Students Premiums (value £5).—Messrs. S. H. Bowers, B.Sc. (Waterhouses, Durham), J. K. Clark, B.Eng. (Bath), A. E. Cunningham (Leeds), E. Jeffrey (Newcastle-on-Tyne), J. Jones (Manchester), E. D. Knight (Newcastle-on-Tyne), F. A. Milne (Glasgow) and F. W. Page (Newcastle-on-Tyne).

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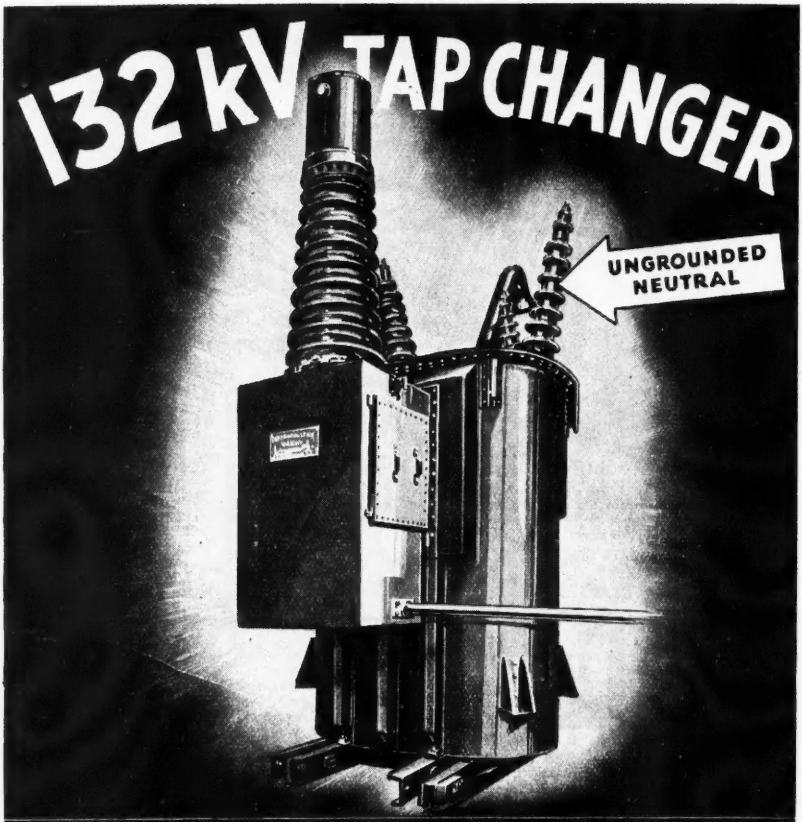

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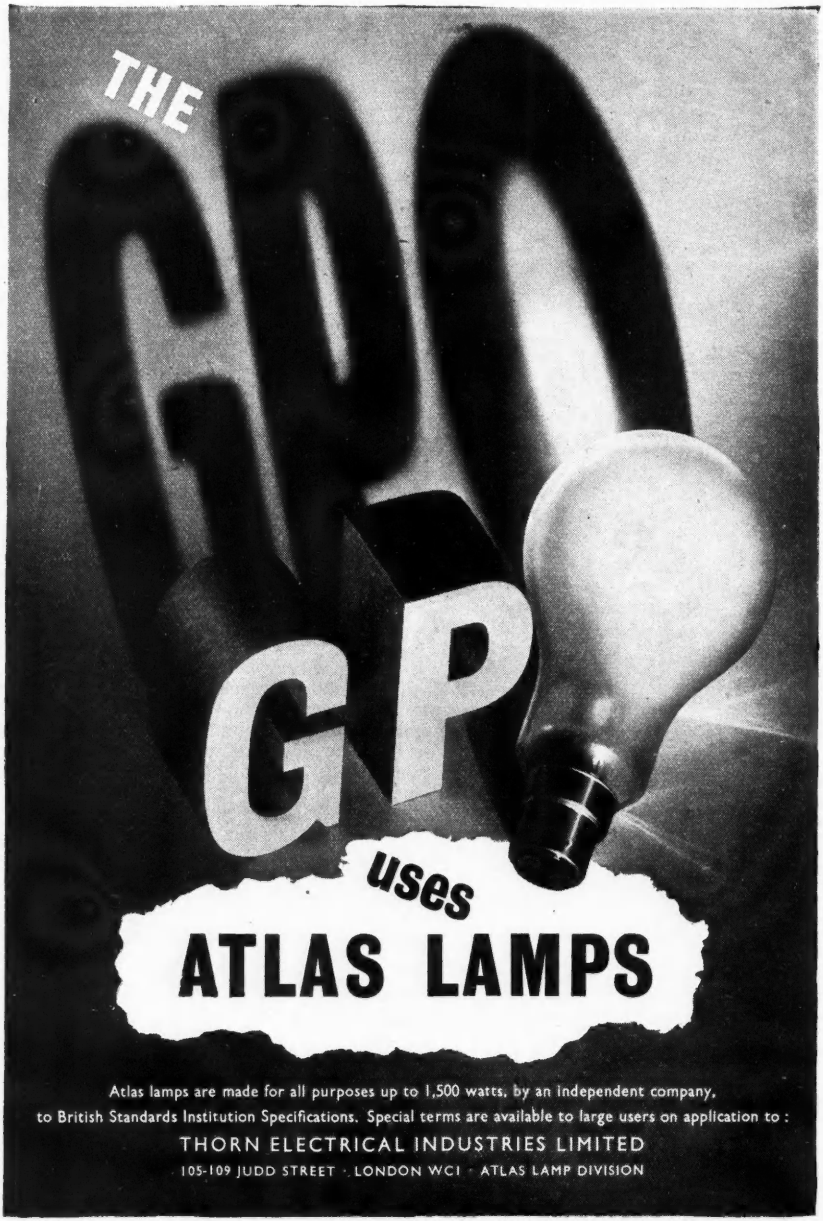
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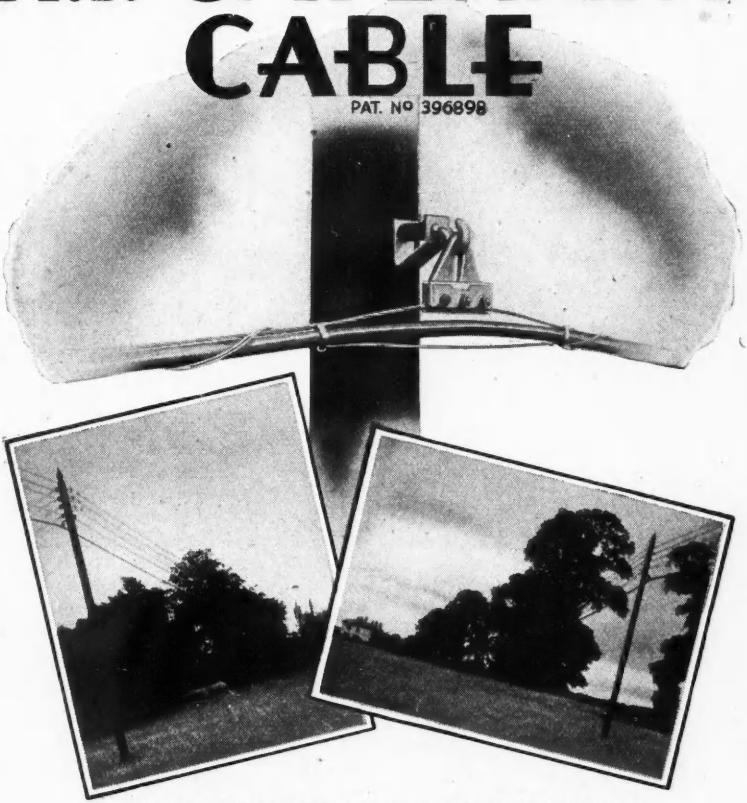

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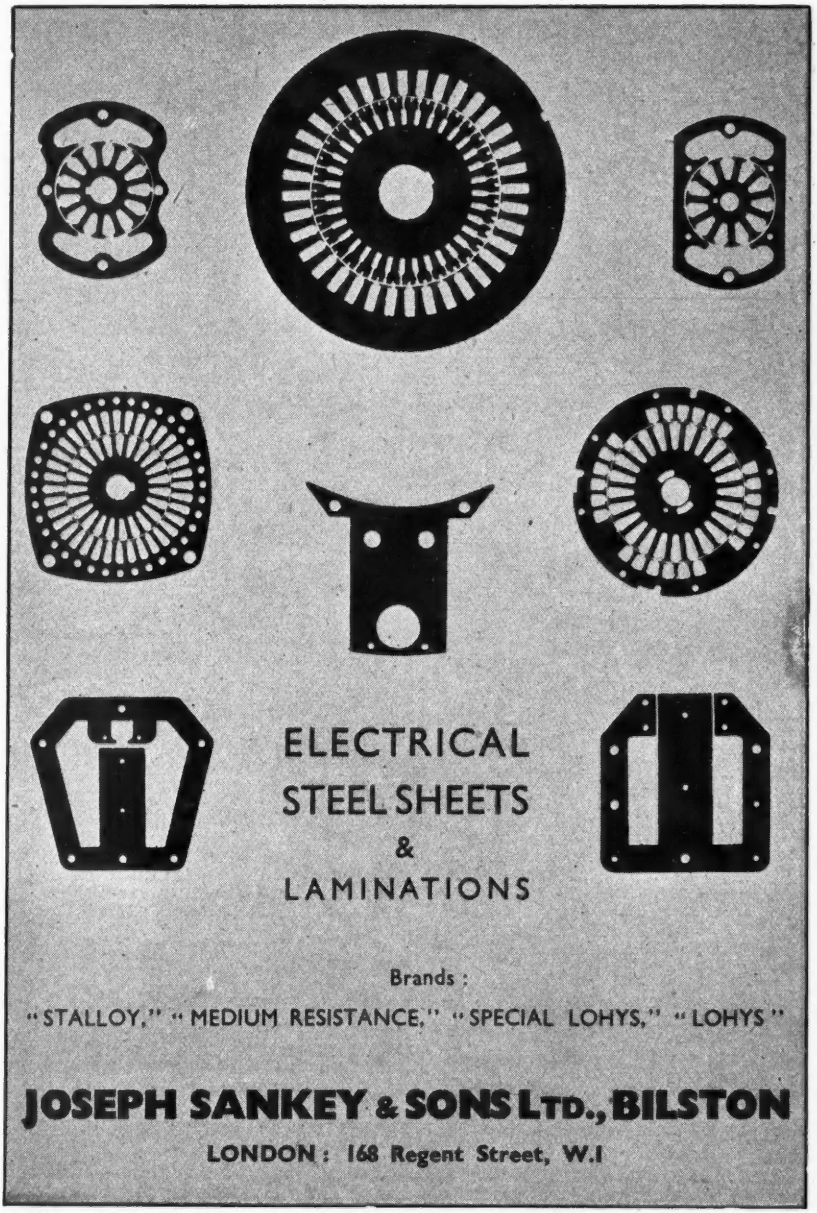
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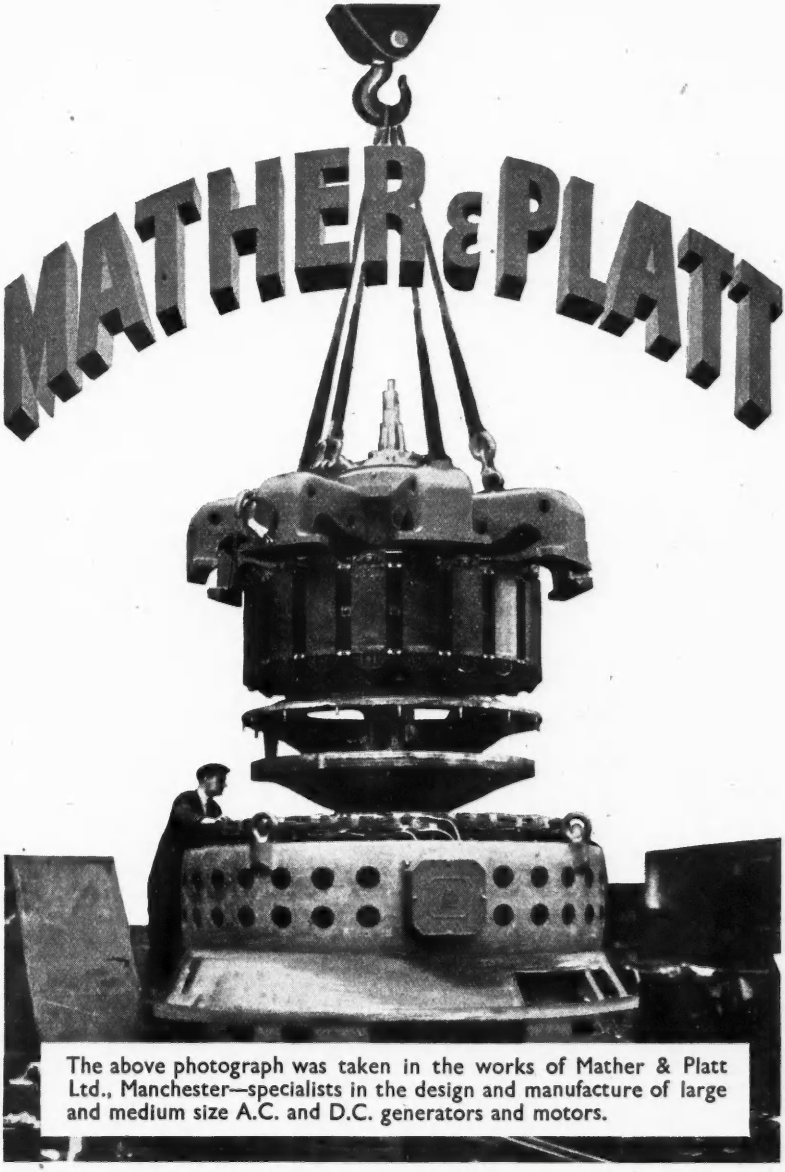

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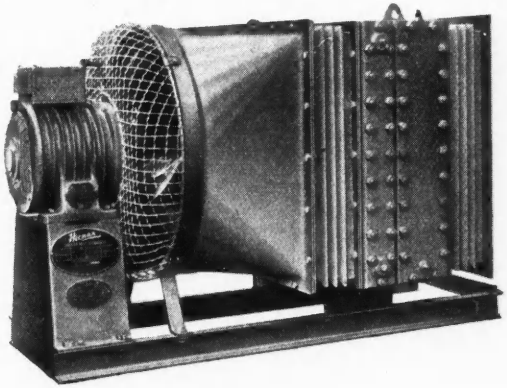

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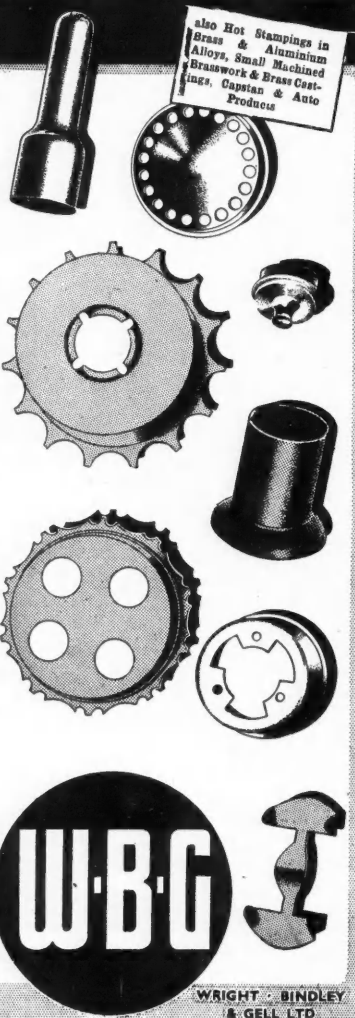

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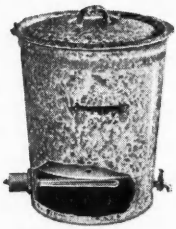

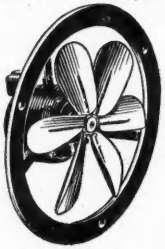

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Combined light trap and fixed Louvre Shutter for above.

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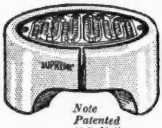

Note Patented "Split" which prevents cracking

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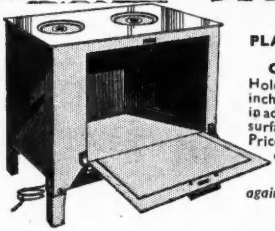

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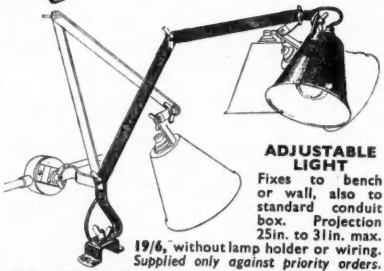

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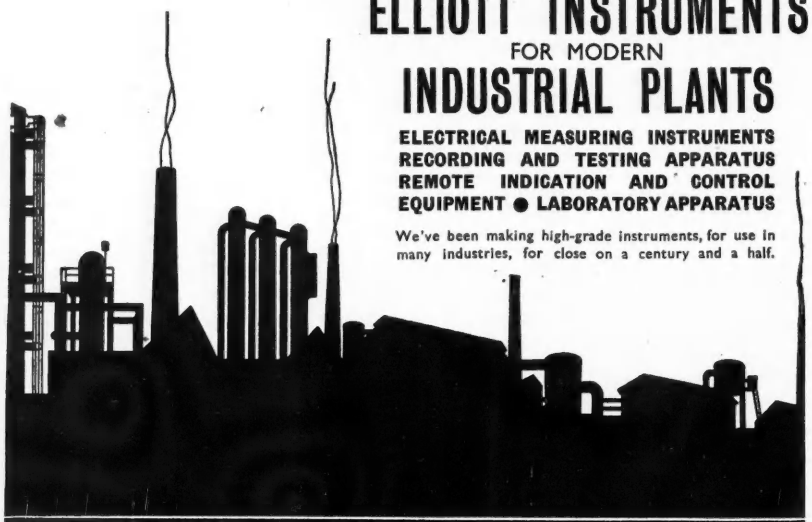

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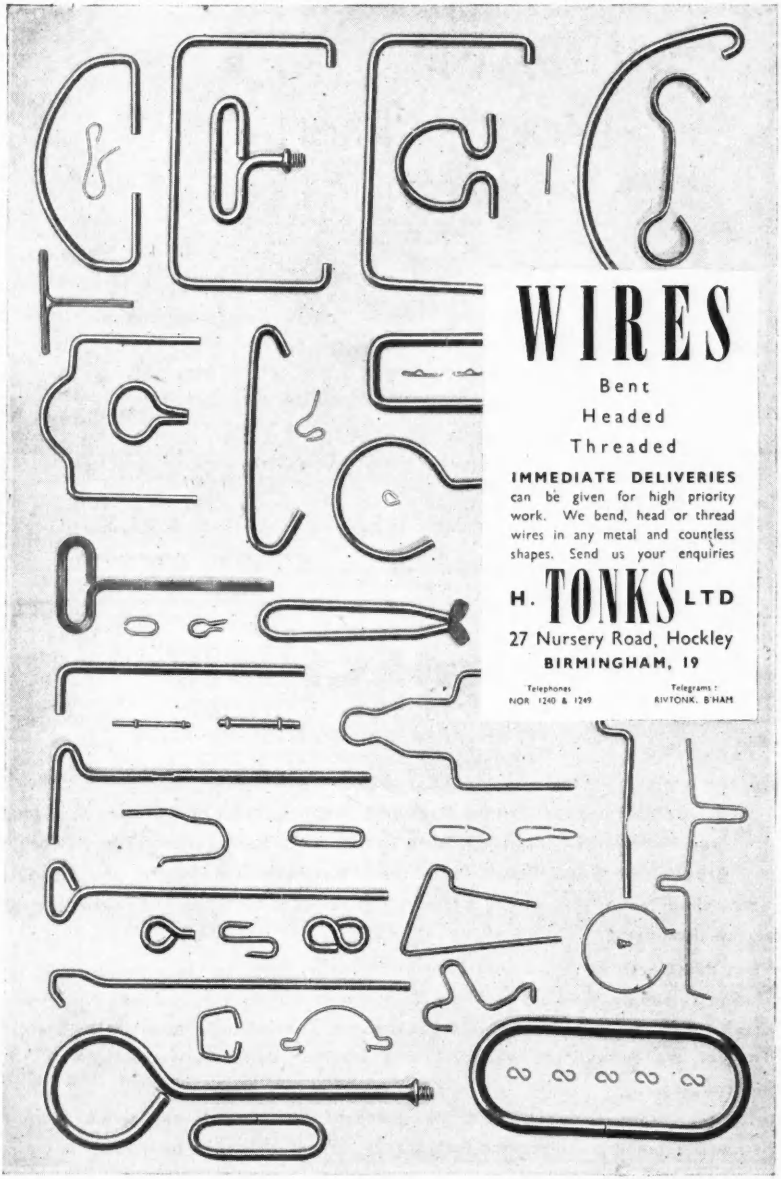

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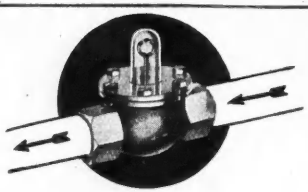

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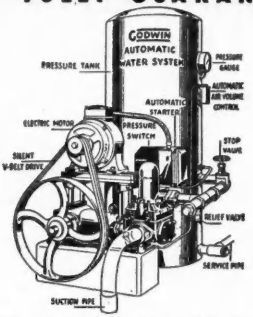

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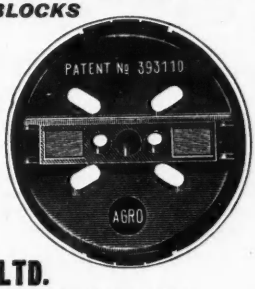

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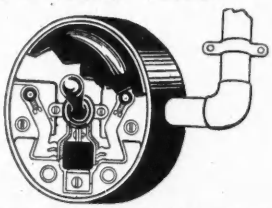

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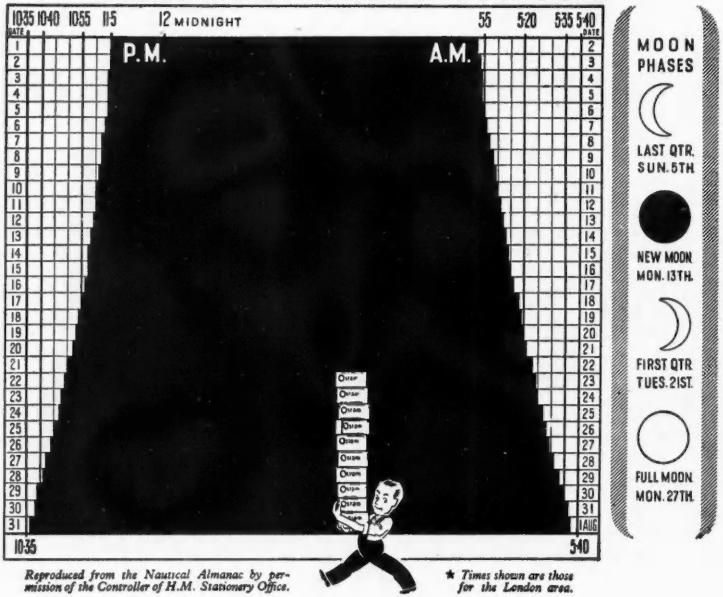

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★ *Times shown are those for the London area.*

Summer it may be, but black-out hours are lengthening again. It is time to think of lighting and how best it can be applied to assist output during the still darker months. Does your lighting system need any revision? . . . If so, complete your plans in good time. The subject of lighting always brings Osram to mind—for wherever you find good lighting, there you will find OSRAM.

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